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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, MONTCLAIR, N. J., Sept. 6, 1898.

There will be an annual meeting of the American Gas Light Association held at Niagara Falls, N. Y., on Oct. 19, 20 and 21, 1898.

The meeting will be called to order by the President, Joseph B. Crockett, of San Francisco, Cal., at 10 A.M., on Wednesday, Oct. 19, in the meeting hall at the International Hotel, the headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The International Hotel is conducted on the American plan, and rates are as follows:

Large parlors on first floor, $3.50 per day; all rooms on second and third floors, $3 per day; rooms with bath, $4 per day. At that season of the year we will be able to have the whole house.

The meeting hall will be on the parlor floor of the International Hotel; thus the headquarters and hall will be in the same building.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by Oct. 9, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"The Effect of the Depth of Fire upon the Practical Efficiency of a Water Gas Generator," by Mr. J. M. Rusby, Jersey City, N. J.

"Notes on Mains and Main Laying," by Mr. Walton Forstall, Philadelphia, Pa.

"The Loss of Illuminating Power of 25 to 30-Candle Gas when Mixed with Air," by Dr. E. G. Love, New York city.

"A Comparison between the Cost of Pumping Gas by Steam and Gas Engines," by Mr. H. L. Rice, Norfolk, Va.

A paper by Mr. E. C. Jones, San Francisco, Cal.

A short paper by Mr. Irvin Butterworth, Columbus, O.

In addition to the above there will be short topics by Mr. H. L. Doherty, Madison, Wis., and Mr. E. G. Cowdery, Milwaukee, Wis.

In accordance with the action taken by the Council and the Association last year, the Beal Medal will be awarded to the author of the best paper presented at this meeting; the question of which is best to be decided by a committee of three past-Presidents, appointed by the President.

All questions for the Question Box should be sent to the Secretary as soon as possible, in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the bulletin board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested wear to their membership badges in plain sight, thereby greatly aiding the officers of the local committee in their work by affording a ready means of recognition.

In order that the Year-book containing the report of this meeting may be published and issued to the members immediately after the meeting—

Notice is hereby given, that if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Niagara Falls, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare

going and one third fare returning by the same route) by the several passenger associations named and under the conditions noted :

The Trunk Line Passenger Committee, covering the territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N.Y.; Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Illinois ; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis ; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers, and the Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis, in other words, the territory west of that of the Central Association, have refused to grant the rates. Members from these territories should buy tickets from starting point to the nearest or most convenient point in the territory of any of the Associations granting the reduced rates, and at such point purchase tickets through to Niagara Falls and obtain a certificate.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations :

First. The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

Second. Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

Third. If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through ticket can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

Fourth. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare only to those holding certificates, signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

Fifth. No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting ; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

Sixth. Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

Seventh. The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (Sunday not reckoned) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

Eighth. No refund of fare will be made on account of any person failing to obtain a certificate.

Special.

If a sufficient number of subscriptions are obtained, the social programme will be as follows : Wednesday evening, reception and hop ; Thursday evening, banquet to which ladies will be admitted on equal footing with the gentlemen ; Friday evening, informal hop ; Wednesday and Thursday, carriage drives for the ladies ; Friday, visit the Niagara Falls power house and other places of interest, and trolley ride down Gorge Route to Lewiston and return.

Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign inclosed card and return to the Secretary at once. It will be necessary to have at least 100 subscriptions.

Be sure to obtain your railroad certificate when buying your ticket for Niagara Falls, as the greater the number of certificates handed in, the easier it is to get the reduction in rates for future meetings.

Apply for tickets and certificates at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing for Niagara Falls.

Be sure to hand the Secretary your certificate as soon as you reach the headquarters.

Apply for return ticket at least 30 minutes before train time, and have your certificate with you.

Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present, holding certificates, each certificate will then be properly indorsed and handed back to owner, before adjournment.

Extracts from the Constitution.

Sec. 12. Application for active membership, or for associate membership, or for transfer from associate to active membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

Sec. 51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

Sec. 52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council.

ALFRED E. FORSTALL, Secretary.

BRIEFLY TOLD.

WELSBACH LAMPS FOR PUBLIC LIGHTING.—He would indeed be nothing but an unobservant traveler, who, during his travels, failed to observe that the Welsbach lamp for purposes of public lighting is gaining rapidly in favor. This increased use or application of the outdoor Welsbach is not confined to any particular section of the States, for it may be seen now in almost every center of population of sufficient numbers to support a gas company ; and the really surprising thing in connection with its development is that its advance in favor has been so rapid. Three years ago he would have been rated an enthusiast who asserted that the Welsbach lamp must shortly become an important factor in respect of the public lighting of populous places ; but in the light we now have to-day, the enthusiast that was is the competent calculator of current times. The bare fact is that thousands of these lamps have been installed during the current year, and the further fact is that thousands more of them are under contract for installation. The best of it all, too, is that the system of operation and maintenance has been so perfected that any gas company may go before its local authorities and tell them just what the company has to give in the way of lighting yield, without thought that an overstatement has been made. Our English correspondent (than whom no more competent or more conservative gas engineer in England may be found) in the current issue of the JOURNAL gives expression to an opinion in which we heartily agree. His opinion is : "A remarkable extension in the use of Welsbachs for public lighting, probably eclipsing that of any previous year, will be a feature of the lighting season upon which we are now entering." The only amendment we offer to the wording of his finding is the substitution of "certainly eclipsing" for "probably eclipsing."

NOTES.—The suicidal policy which marks the existing strife for control of the gas situation in Trenton, N. J., would be of comparatively little moment were its effects to be sustained merely by the warriors engaged in it. There are others, however, who are in the gas trade legitimately, and whose properties cannot fail to be injured through the gladiatorial announcement of the projectors of the Peoples Gas Improvement Company, of Trenton, that, on November 1st next, they will be ready to furnish gas "at the rate of 50 cents per 1,000 cubic feet !" They cannot exist for any appreciable time on such a charging basis ; but meanwhile they are simply making ammunition that will be exploded with good effect against the entire gas industry of New Jersey by the incoming State Legislature.——The Western Gas Construction Company, of Fort Wayne, is under contract with the Detroit Gas Company to replace an existing water gas set with a modern set up to producing 1,000,000 cubic feet per day.——At a meeting of the Directors of the Binghamton (N. Y.) Gas Works, held the 19th inst., Mr. George F. O'Neil, owner of the Binghamton *Leader*, was elected to the vacancy on the Board caused by the resignation of Mr. George Treadway Thompson. General Manager Wheeler reported that something over 8 miles of gas mains had been laid during the last 60 days. Meanwhile, work on the construction of the new generator house was concluded, also the beds on which the water gas generating apparatus is to be placed. The orders booked for stoves so far in September exceed those booked for a like number of days in August.——In the competition for the purchase of the natural gas plant operated on municipal account in Tiffin, Ohio, four bids were made, ranging from $45,000 to $25,000. ——The National Board of Fire Underwriters is considering a plan for the adoption of a schedule that will govern the installation and use of acetylene lighting plants throughout the States.

The Yeadon Washer-Scrubber.

The *Journal of Gas Lighting* thus describes a form of washer-scrubber which is the invention of Messrs. Yeadon, Son & Co., of Leeds, England :

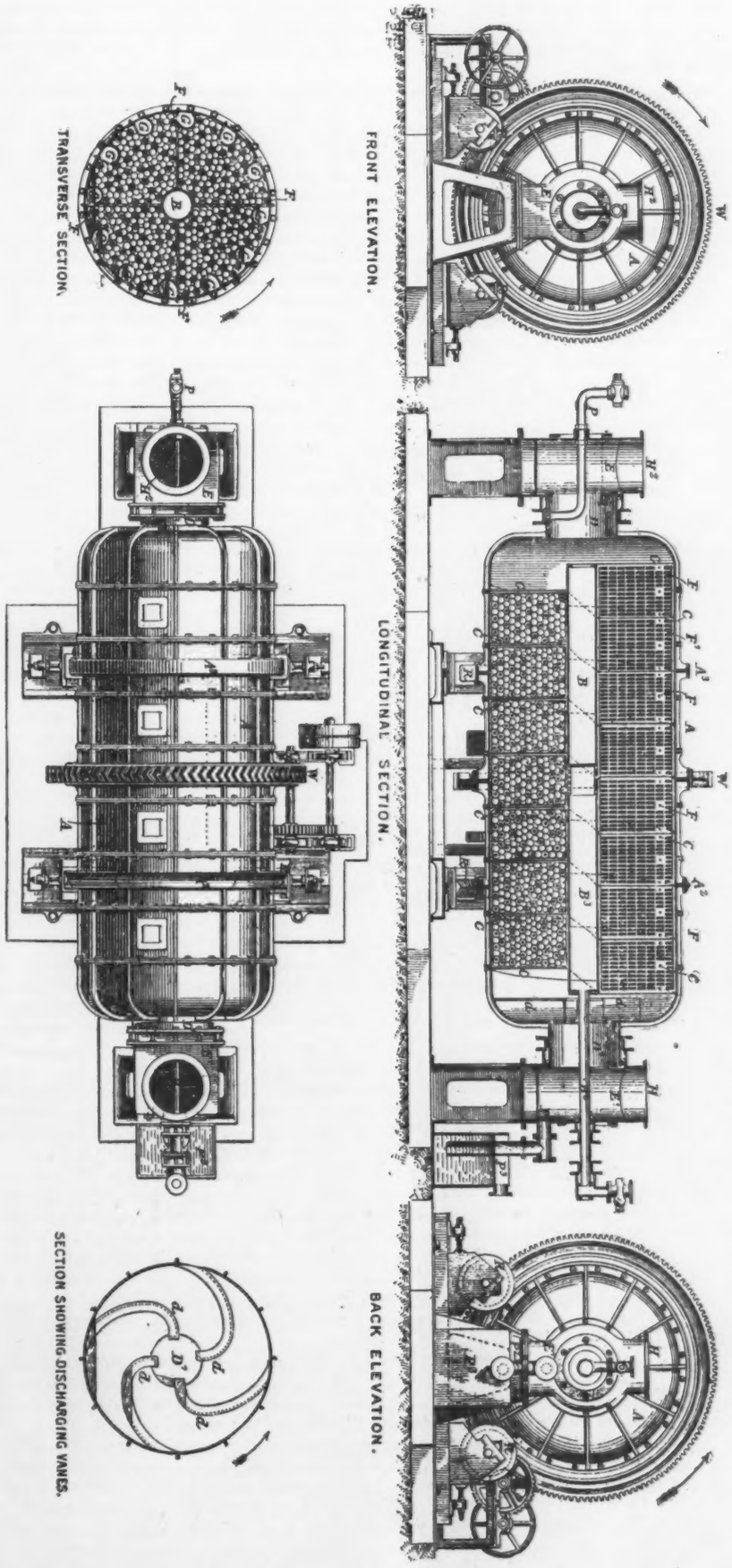
It will be seen from the illustration that inside the revolving cylinder *A*, and running nearly its entire length, is a central tube *B*, closed at one or both ends. Between the outside circumference of this tube and the internal surface of the cylinder there is fixed the continuous spiral screw *C C*, which also runs nearly the whole length ; both edges of this screw being fitted with angle iron for securely fixing it to the cylinder, and made perfectly gas-tight. The tube is thus carried by the cylinder to which it is attached by the spiral screw ; the whole revolving together. The ends of the cylinder are rounded off to a smaller diameter, as at *D D*^{1}, and made suitable for revolving in stationary mouthpieces *E E*^{1}, at each end. These mouthpieces are fitted with adjustable glands to keep the ends gas-tight ; *E*^{1} being for the inlet, and *E* for the outlet of the gas. The edges of the spiral screw being gas-tight, the gas must follow the space formed by the spiral screw. In different parts of this spiral screw, and at suitable distances, are fixed any number of perforated division plates *F*, through which the gas has to pass. These plates thus divide the area contained in the screw into a series of chambers, each of which is filled in with wood balls ; the plates preventing them working through the cylinder.

In any part of the mouthpiece *E* a pipe *P* is inserted for the inlet of the water into the cylinder. At the bottom of the mouthpiece *E*^{1} is fixed a sealed outlet pipe *P*^{2}, ending in the cistern *P*^{3} for the escape of the ammoniacal liquor or foul water after it has passed through the cylinder. The cylinder end *D*^{1} is fitted with spiral or coil pipes *d*, by means of which the ammoniacal liquor is raised from the bottom of the cylinder in revolving, and delivered automatically through the small end and the sealed pipe *P*^{2}.

At the back of each of the perforated division plates, and close to the internal surface of the cylinder, is fixed a bucket *G* for raising the water lying at the bottom of the cylinder, and pouring it over the wood balls, so as to keep their surfaces constantly wet and dripping, carrying the water forward with the next division of the screw. Other auxiliary buckets, as at *G*^{1}, perforated or solid, are fixed to the internal surface of the cylinder, to pour the water on to the balls ; the number, size and perforation of these buckets being adjusted to keep the balls constantly wet, and to carry the water continuously forward through the spiral screw.

On the outside of the cylinder there are bearing rings *A*^{2} and *A*^{3}, turned so as to revolve truly on the bearing rollers *R* underneath. One of these rings, as at *A*^{3}, is made of ∧ shape, with the bearing rollers to suit, to prevent the cylinder working end-wise. There is also fixed on the circumference of the cylinder a toothed wheel *W*, driven by any suitable gearing, for communicating the revolving motion.

The pure water is admitted through the pipe *P*, and, after going through the cylinder, escapes by the sealed outlet pipe *p*^{3}. The gas entering at *H* meets the water, and, after passing through the cylinder, escapes at the outlet



pipe H^5. If found advisable, an inlet pipe connection can be arranged to the center or any other part of the central tube, as at B^2 and B^3, from any outside cistern, by means of which ammoniacal or other liquor can be admitted there into the screw space to assist in the washing of the gas.

In some other rotating washers, a large area of washing space is lost in consequence of nearly one-half of each drum being always immersed in the water, in addition to the loss of space outside and between the drums themselves. By the use of the Yeadon washer, the patentees claim that, with the exception of the area occupied by the small central tube, the whole of the internal cubic area of the cylinder is utilized for the purpose of the gas coming in contact with the wet surfaces of the balls, and passing freely through—thus requiring proportionately much less length and diameter than with other rotating washers; and that, in addition, by the gas flowing regularly and continuously through the space formed by the spiral screw, it is more evenly diffused and brought into contact with the wet surfaces of the balls. They also claim that, by dispensing with the ordinary internal shaft, complicated drums and other frictional surfaces, the washer is simpler, less liable to get out of order, more easily repaired, and requires less motive power, thus securing greater efficiency, with a considerable saving in first cost, motive power and repairs.

The Canadian Niagara Power.

Iron Age says that the Government of the Province of Ontario, Canada, is being agitated to take action in the matter of the franchise granted by the Commissioners of Queen Victoria Niagara Falls Free Park to the Canadian Niagara Power Company. This franchise is one of the most remarkable rights of its kind ever granted a company in America. It bears date of April, 1892, and while the period covered by it is 20 years, it may be extended for a century. Under its provisions the Canadian Niagara Power Company were to have commenced work on or before May 1, 1897, and at that time they did break ground. They were to have proceeded so far with the work by November, 1, 1898, that they will have completed water connections for the development of 25,000-horse power, and to have actually ready for use, supply and transmission 10,000 developed horse power. November 1 is rapidly approaching and the work of development is practically not yet commenced. But in the meantime the Canadian Niagara Power Company have secured from the Park Commissioners the right to erect two 500-horse power generators in the station of the Niagara Falls Park and River Railway in the park in order that they might be prepared for the prospective demand for power. Their readiness to supply electric power at any point within four miles of the park has been extensively advertised throughout the Dominion, but there is not the response from prospective purchasers that many of the power agitators would have people believe. In fact, the only customers so far are the Canadian branch of the Carborundum Company, using 200-horse power, and the Carmelite Monastery, using about 70-horse power.

It has been apparent to the Canadian Niagara Power Company for some little time that their chief market for power must be Toronto and such other cities as are anxious for the Niagara current. They have asked for an extension of the time in which they must have a certain amount of power developed, taking the position that they now have more developed power than is called for, and that it must needs require longer time to develop the Toronto market and perfect the transmission, as Toronto is 90 miles distant by the land route from the Falls. Certain politicians, however, do not see it that way and feel that the Government should revoke the franchise, it being their belief that another company would be organized to develop the project with greater rapidity. To such belief the Commissioners of Victoria Park take exception, expressing confidence in the Canadian Niagara Power Company and stating that it would be difficult to get such powerful capital again interested in the power development in Canada.

To some Canadians the development on the New York State bank of the river by the Niagara Falls Power Company has proved an eyesore, the feeling being that as the Niagara Falls Power Company and the Canadian Niagara Power Company are practically one and the same, the resources of one side of the stream are being advanced and developed to the cost of the other, the comparative industrial interests of the two countries not being taken into consideration. For this reason the members of the Provincial Parliament are being solicited to revoke the power franchise. There are several reasons why this is not likely to be done. The annual rental that the Canadian Niagara Power Company pay for the privileges of which they have not so far availed themselves is $25,000, and this amount has been paid every year since 1892. It is believed to be the greatest amount paid for similar rights in the world; in fact, when a reliable company start to develop a locality they are usually given such rights free of cost. On the New York State side the only obligation that the State placed on the Niagara Falls Power Company for the rights it granted to that Company was that the Power Company should furnish water and electricity for lighting the State Reservation. The annual rental received from the Canadian Niagara Power Company is an important item in supporting the Park, the annual cost of maintenance of that pleasure ground being about $40,000. In no other way could this sum be obtained than by a rental of privileges. This being the case, the following facts about this greatest of power franchises are especially interesting:

The Canadian Niagara Power Company were incorporated in April, 1892. The capital stock of the Company is $3,000,000. They control the exclusive right to develop Niagara power for commercial uses in Victoria Park, on the Canadian side of the river. They pay more for this privilege than any other power company in the world pays for similar rights. Their rights are almost irrevocable and they are good for a century from the date they were granted. These rights were obtained through the Ontario Legislature and the Government of Ontario.

The President of the Company is Col. Albert D. Shaw, of Watertown, N. Y. Others interested with him are Francis Lynde Stetson, William B. Rankine and other members of the Niagara Falls Power Company. From this it will be seen that the Niagara Falls Power Company practically control Niagara power.

The company's agreement provides that they shall begin work by May 1, 1897, and have 10,000-horse power developed by November 1, 1898. They must have completed water connections by the date last mentioned for developing 25,000-horse power. For the first 10 years the company's rental is $25,000 a year, the rent being computed from May 1, 1892. The rental for the second 10 years increases $1,000 each year until at the end of the twentieth year it reaches $35,000, at which rate it is to be continued. The rent for the first two years, $50,000, was paid when the articles of agreement were delivered, and now the rent is paid in semi annual installments on May 1 and November 1. The rent is paid to the Commissioners of Queen Victoria Niagara Falls Park, the Canadian free Niagara, and forms the most important revenue to support the park. If at the end of 20 years the company desire a renewal of the franchise for another 20 years they must give 12 months' notice to the Park Commissioners, when they shall be entitled to receive the desired lease, the intention being to confer upon the company rights for an original period of 20 years and for four further periods of 20 years each.

The method of development to be employed on the Canadian side will be very similar to that now established on the New York State side—a tunnel and wheel pit. On the Canadian side the tunnel which it will be necessary to build will be much shorter than that at Niagara Falls, N. Y. Its length will be only about 800 feet, and for this reason the power will not cost so much for development.

The agreement of the company with the Park Commissioners does not limit them to any number of horse power. For this reason the amount of power developed by the proposed Canadian tunnel is likely to be much greater than that developed by the New York tunnel. The conditions on the Canadian side are such that many more horse power can be developed there than on the New York State side for the same money. The construction of the inlet canal will be much easier in Canada, for the reason that there is a natural channel which will require but little extension to afford the necessary facilities. The water for the power developed will be taken from the river between the head of Cedar Island and the mainland south thereof. The power house will be erected near the foot of the high bluff between the Carmelite Monastery and the rear of Table Rock House. The franchise provides that the company shall not occupy a space more than 1,200 feet long and not more than 100 feet in width. The company have the right to excavate tunnels to discharge the water from the power house into the gorge below the Horseshoe Falls. The water from the tunnel on the New York State side is discharged below the American Fall.

One of the very important grants of the franchise is that they may transmit one-half the power out of Canada. This privilege will make the Canadian station an important adjunct of the Niagara Falls, N.Y., plant, and should an accident occur in either of them the current from the other could be furnished all customers. In addition, this right makes it possible to increase the power in use at Niagara Falls by just one-half of the amount developed on the Canadian side. It seems highly improbable that all the power to be developed on the Canadian

ide would be used there, for the demands of Canada for power are not so great as in the States. But where the power is sold in Canada it must be sold at not more than is asked for similar power for similar uses in the United States—that is, the Canadian Niagara Power Company must not ask more for power than the Niagara Falls Power Company.

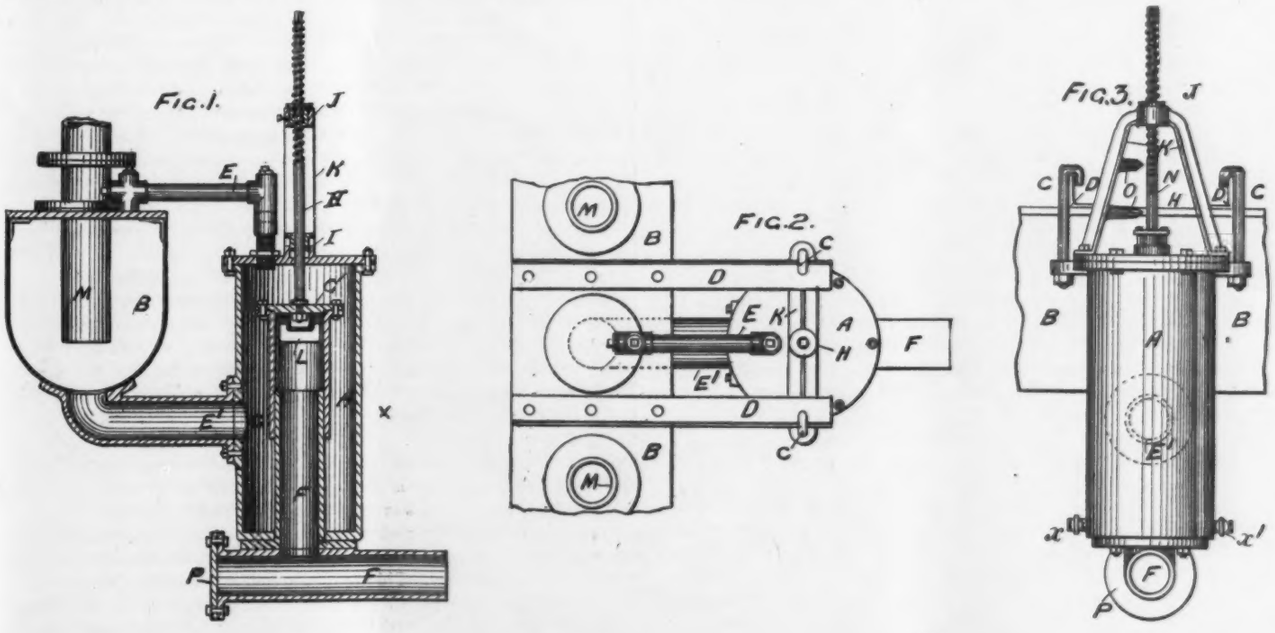
The Lieutenant-Governor in Council may at any time make the Canadian Niagara Power Company make a return of prices charged, verified under oath. Where a dispute arises as to the price or power furnished in Canada the High Court of Ontario shall have jurisdiction to hear and determine the question. If for one year the Canadian Niagara Power Company should fail or continuously neglect to generate electricity or pneumatic power as agreed, unless by unavoidable accident, their rights would be forfeited. Plans and profiles for all work to be done shall be submitted to the Park Commissioners for approval.

The contract is one of the most important ever made for the development of Niagara power. It is exclusive and allows wonderful development. Should the company hold the franchise for a century they will pay no less than $3,355,000 rental. The construction of the power plant will cost millions of dollars. Already several American factories are preparing to erect plants there to maintain their Canadian patents. Among these is the Carborundum Company of Niagara Falls. The Pittsburg Reduction Company are ready to build a plant in Canada when power is available.

Hislop's Dip-Pipe Valve.

On the 13th inst. U. S. Letters Patent (No. 610,538) were issued to Mr. George R. Hislop, of Paisley, Scotland, for certain improvements in dip-pipe valves. Using the words of the specification :

This invention has for its object by improved apparatus to afford greater facility for regulating the seal in and for drawing or conducting away the tar from hydraulic mains in gas works and from like receivers, and also to afford means for shutting off communication of the main with the discharge pipe without the use of stopcocks.



As represented in the accompanying drawings, in vertical section at Figure 1, in plan at Fig. 2, and in elevation, looking from *X*, Fig. 1, at Fig. 3, the improved apparatus consists of a vessel *A*, preferably cylindrical in form, but which may be of other shape, and which is suspended at one side of the hydraulic main *B*, by hooks or catches *C*, taking over angle iron bars *D*, bolted to the top of the main or by other means of suspension.

The vessel *A* is at its upper end connected by a pipe *E* to the top of the hydraulic main for the purpose of equalizing the pressure in both, and it is also connected by a pipe or branch *E'* to the bottom of the main, while to the lower part of the vessel a flanged T-shaped pipe *F* is secured, the vertical branch *F'* of the pipe passing up through the center of the vessel to such a height that its upper end is level or about level with the bottom of the main *B*, as shown, so as to be capable of emptying or drawing off the whole of the tar and liquid therefrom.

Over the upper end of the branch *F'*, and which is turned true externally, a hollow piston *G* is fitted, the piston being bored out to receive the branch and render the same tar and water tight.

The upper end of the hollow piston *G* is closed by a faced flange plate *G'*, bolted to a faced flange on the piston, and in the center of the plate a spindle or lifting rod *H* is secured, the said rod, which is screwed at its upper end, passing through a stuffing box *I* in the cover of the vessel *A*, and thence through a tapped nut *J*, carried by a saddle or bracket *K*, bolted to the said cover. The hollow piston *G* has openings or ports *L*, made near its upper end, through which the tar and liquor flow from the interior of the vessel *A*, into the pipe *F*, and thence away from the plant, the depth of seal in the main *B* above the bottom of the dip-pipe *M* being regulated by the height of the under sides or lips of the openings *L* above the bottom of the pipe *M*. The spindle *H*, regulating the position of the piston, has a scale marked upon it, as at *N*, Fig. 3, which, in conjunction with the pointers *O*, secured to or formed on the bracket *K*, indicates the depth of seal or whether the main is empty, which it is when the piston *G* is screwed down until the ports *L* are opposite the upper end of the branch *F'*. When the ports *L* are below the level of the upper end of the branch *F'*, and the under side of the cover *G* is screwed down against the upper edge of the said branch, the hollow piston *G* is out of action.

The improved apparatus constructed as hereinbefore described thus possesses the following advantages : First, it provides for accurate adjustment of the depth of seal above the bottom of the dip-pipe *M*; second, it enables the hydraulic main to be flushed or emptied at pleasure ; and third, by screwing down the hollow piston until its cover *G'* bears upon the upper end of the branch *F'*, communication between the main *B* and the pipe *F* is shut off, and by removing the flange *P* on the end of the pipe *F* access can be had for the purpose of cleaning out the same, and that without the employment of any stopcocks and without interfering with the regular working of the main. Also by removing the cover of the vessel *A* and weighting down the piston *G* access can be had to the interior of the vessel. The vessel *A* is furnished with stopcocks *x x'* at its lower end for the admission of steam or hot water when required.

The claim of the inventor is :

The combination with the main *B* and dip-pipe *M*, of bars *D* extending at one side thereof, vessel *A* suspended from said bars, pipe *E'* connecting the bottom of the main *B* with vessel *A*, pipe *F'* extending into vessel *A*, about to the level of the bottom of main *B*, a hollow piston movable on pipe *F'*, said piston having an opening near its top, and being closed at the top, and means for moving the piston, as set forth.

On the Occurrence of Hydrogen Sulphide in the Natural Gas of Point Abino, Canada; and on a Method for the Determination of Sulphur in Gas Mixtures.

By Mr. Francis C. Phillips, in *Jour. Am. Chem. Soc.*

On the northern shore of Lake Erie, ten miles west from Buffalo, a narrow promontory extends for a distance of about two miles out into the lake. This promontory, known as Point Abino, forms the southern extremity of an important region of natural gas production from which a large part of the gas used in Buffalo at the present time is derived.

In 1892 a well was drilled by the Provincial Natural Gas Company near the extremity of Point Abino, to a depth of 600 feet. Gas was found in this boring at 550 feet below the surface, and again 50 feet deeper, or at the base of the Niagara limestone. The well has maintained its productiveness with little loss of pressure since the date of its drilling.

As regards chemical composition, the gas derived from this limestone at Point Abino differs in a remarkable manner from that which is usually found in the Devonian rocks of Western Pennsylvania in the fact that it contains hydrogen sulphide, easily recognizable by its strong odor, by its action upon polished surfaces of silver and copper, and by the presence of sulphur dioxide among the products of its combustion. Two other wells at Point Abino yield gas of similar character (known locally as "sulphur gas") from the same geological formation.

It is common in drilling wells into the Niagara limestone in this region to find natural gas impregnated with hydrogen sulphide, sometimes occurring in small quantities, apparently stored in cavities from which it soon escapes and is exhausted; in other cases the sulphur gas, when once it is tapped, may continue to flow for an indefinite period.

In cutting a sewer tunnel through the limestone, 50 or 60 feet under the city of Niagara Falls, and extending about one mile from 23d street to the river, hydrogen sulphide was frequently encountered, and was the cause of much inconvenience to the workmen, requiring the construction of ventilating shafts for its removal. The occurrence of this gas was always accompanied by a strong flow of dark-colored water.

Mr. W. A. Brackenridge, resident engineer for the Cataract Construction Company, informs me that hydrogen sulphide was found at a depth of about 60 feet in excavating for the wheel pit and tunnel shaft of this Company at Niagara Falls. Patches of gypsum were often found about 10 feet above the gas-bearing stratum. If this gas is allowed to come in contact with the polished metal surfaces about the power house they are rapidly blackened. Natural gas of the same character has been found near Fort Erie, at several places between Buffalo and Point Abino, and also at Port Colborne on Lake Erie, 20 miles west from Buffalo. Water well drillers state that they often strike sulphur gas at Chippewa, south of Niagara Falls. Southeast from Buffalo, from 4 to 6 miles, hydrogen sulphide occurs in the Niagara limestone of the West Seneca field, and at Alden, 18 miles east from Buffalo. The sulphur gas is found in wells distributed over a territory extending irregularly for about 40 miles east and west, and about 20 miles north and south.

Natural gas occurs in the region at three other horizons below the Niagara limestone; namely, the Clinton limestone, the Medina sandstone, and the Trenton limestone, which latter rock was reached at a depth of 2,940 feet in a well drilled 6 miles north of Point Abino. The Niagara limestone seems, however, to be the only one of these formations which yields gas containing hydrogen sulphide.

On September 2, 1896, I visited the well at Point Abino, and by the courtesy of Mr. E. Coste, Engineer for the Provincial Natural Gas Company, was enabled to conduct some tests of the gas upon the spot and to collect samples for analysis. Of these tests made at the well and the results obtained, the following is a brief summary:

On leading the gas through an alkaline lead acetate solution, a heavy black precipitate was at once produced.

An ammoniacal cadmium chloride solution yielded a bright yellow precipitate. The odor of hydrogen sulphide was very strong.

It seemed to be of interest to ascertain whether organic sulphur compounds were present among the hydrocarbons of this gas. Accordingly, a stream of the gas was caused to bubble through an alkaline lead acetate solution, in order to absorb hydrogen sulphide, and then through an alcoholic solution of mercuric chloride. The experiment was continued for 6 hours at the well. Methyl, as well as ethyl sulphide would have caused a precipitation in the mercuric chloride solution, if present even in very small quantity. The solution was found to remain clear. The absorbent solutions were returned to the laboratory to be further tested. The alkaline lead acetate solution was warmed upon a water bath while a current of nitrogen was passed through the flask and into an alcoholic solution of mercuric chloride. In this latter solution no precipitate appeared, nor was any odor attributable to a sulphur ether observed. These tests seemed necessary, as a volatile sulphur ether might have condensed unchanged in the lead acetate solution during the passage of the gas in the trials which were made at the well. The nitrogen stream was used in order to evaporate any traces of such condensed sulphur compound, should there be any such, and carry its vapor over into the reagent solution.

In order to test for methyl mercaptan advantage was taken of the fact that its vapor is readily absorbed by an alkaline lead acetate solution and is again evolved when the liquid is acidulated and warmed. If the escaping vapors are led (by a nitrogen stream) into a solution of palladium chloride a cinnamon-colored precipitate is produced. This test was performed but the results were negative. The odor of mercaptans was not noticeable. It is of course possible that experiments with still larger volumes of gas might have disclosed the presence of traces of such organic sulphur compounds.

The vapors of methyl and ethyl sulphide, even if present in a gas in quantity insufficient to produce a precipitate in mercuric chloride solution, are absorbed by the solution, and impart to it their characteristic odor, so that this reagent may in such manner serve for the detection of very slight traces not otherwise recognizable.

In order to test for the presence of carbon monoxide the gas, as it flowed from the well, was passed (1) through lead acetate solution containing a large excess of sodium hydroxide to remove carbon dioxide and hydrogen sulphide, (2) through lime water, in order to maintain control of the efficiency of the first solution, (3) through palladium chloride solution, and (4) through lime water. When present in a gas mixture, even in traces, carbon monoxide is easily recognized by this method, the second lime water becoming milky as a result of the oxidation of the carbon monoxide by the palladium chloride. The palladium chloride is simultaneously reduced, yielding a black precipitate of finely divided metal.[1]

In testing for free hydrogen the method I have described in the *American Chemical Journal*, 16, 259, was used. The gas freed from hydrogen sulphide and dried by phosphoric anhydride, was passed through a tube containing dry palladium chloride and then into silver nitrate solution. Dry palladium chloride is quickly reduced in the cold by free hydrogen, with formation of hydrogen chloride, which then produces its characteristic effect upon the silver nitrate solution.

The results of these tests, conducted at the well during about six hours, were negative, and the conclusion seems justified that carbon monoxide and free hydrogen do not occur in the Point Abino natural gas in recognizable quantity.

Tests for ethylene were made in small portions of the gas brought back to the laboratory for the purpose, but with negative results. Determinations of hydrogen sulphide were made by agitating a measured volume of the gas with an alkaline solution of lead acetate, in a bottle fitted with a rubber cork, traversed by inlet and outlet tubes having stopcocks, and by a burette for the introduction of the reagent solution. This part of the work was carried out at the well, due account being taken of the temperature and barometric pressure. The bottle used was of 1890 cc. capacity. The precipitated lead sulphide was returned to the laboratory, its sulphur oxidized to sulphuric acid, and from the weight of barium sulphate obtained the proportion of hydrogen sulphide in the original gas was calculated. The results of four determinations made in this manner were 0.76, 0.73, 0.75 and 0.72 per cent.

Nitrogen was determined by combustion of a measured volume of the gas (about 150 cc.) over copper oxide, and measurement of the residual gas over mercury. This residue may include other inert gases besides nitrogen, but these have been classed together in the present analysis. The method used for collection of this inert residue is one requiring a somewhat complicated form of apparatus. Its details will be described in a later paper.

Carbon and hydrogen were determined gravimetrically, by weighing the carbon dioxide and water produced when a measured volume of the gas was burned over copper oxide. For this purpose glass cylinders holding from 350 to 400 cc. were filled with the gas at the well.

Results of analysis of natural gas from the Point Abino well.

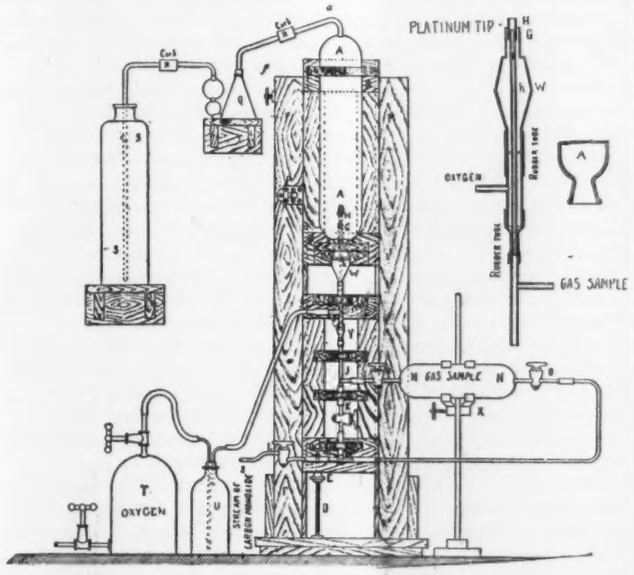
Hydrogen sulphide	0.74 per cent.
Nitrogen	2.69 "
Carbon dioxide	trace
Carbon monoxide	0
Hydrogen	0
Ethylene	0
Hydrocarbons of the paraffine series	96.57 per cent.
	100.00 per cent.

1. For details of this method as applied to natural gas see *American Chemical Journa* 16, 275.

The percentage compositions of these paraffines by weight was :

Hydrogen.....	24.10 per cent.
Carbon	75.90 "
	100.00 per cent.

With a view to greater certainty in the determination of hydrogen sulphide it seemed desirable to employ a method by which the gas could be burnt, and the sulphur collected as barium sulphate. Accordingly, a process was devised for the combustion of a measured volume



of the gas in an oxygen atmosphere, absorption of the sulphuric or sulphurous acid produced, and weighing of the sulphur as barium sulphate. Such a method is not new in principle, having been proposed by various authors for the determination of sulphur in gases. As adopted for use in the present instance the method may be described as follows :

The gas sample is contained in the vessel *N* (which may be replaced by a larger vessel if necessary). It is burnt from a narrow glass tube *h* surmounted by a roll of thin platinum foil *H*, in a light blown glass cylinder *A*, which is about 40 cm. long and about 10 cm. wide. The cylinder is closed below by a ground stopper *W*. This stopper is hollow and carries the narrow tube of about 1½ mm. bore supplying the gas to be burnt. The narrow tube passes up through one of larger diameter which receives oxygen by way of the side tube *I* from a holder *T* and delivers it just below the flame of burning gas. As is shown in the sketch of the stopper *W* and its connections, the burner tubes are arranged concentrically, the oxygen issuing from the wide tube *G* and encircling the flame of the gas burning at the tip *H*. The rate of flow of the oxygen is approximately indicated by the rapidity of its bubbling through water in the bottle *U*. It seemed desirable to effect the expulsion of the gas from the sample vessel into the cylinder where it is to be burnt without the use of water, which by reason of its solvent power might absorb and partially remove those constituents of the gas which are to be determined. Mercury is out of the question. A gas appeared preferable and carbon monoxide was employed for the purpose. The carbon monoxide is contained in a gasholder and enters by the tube *L*, passing upward by *K* and *h* to the platinum tip *H*, where it is ignited. The combustion cylinder, which is mounted on the movable frame *BB*, is then lowered over the ignited carbon monoxide jet and clamped in position by the screw *f*. The outlet tube *a* is connected with the flask *Q* containing a solution of sodium carbonate to which some bromine has been added. The lower sliding frame *CC* can be raised or lowered by the nut *E* moving upon the fixed screw *D*. The carbon monoxide jet being ignited and the oxygen supply by way of *I* being adjusted so as to insure a steady flame, the stopcocks *OO* are opened and then *K* is closed. The carbon monoxide then goes by way of the gas sample vessel to the jet, driving out the contained gas and carrying it into the combustion cylinder, where it is burnt. Many liters of gas may be burnt in this manner without danger of the flame becoming extinguished. The sodium hypobromite solution into which the products of the combustion have passed contains the sulphur as sodium sulphate, and, after acidulation and evaporation, may be used for the determination of sulphur as barium sulphate. After the combustion is finished the apparatus is tilted down, the cylinder is rinsed, and the rinsings added to the contents of the flask *Q*. The large bottle *S* containing a few drops of bromine water, which is renewed from time to time during the process, is used to insure complete absorption of products of combustion of the sulphur. The connections *RR* consist of corks soaked in melted paraffine or spermaceti, rubber being objectionable on account of the sulphur which it contains.

The combustion of natural gas, or other gas rich in hydrogen, leads necessarily to the production of much water. This water is partly condensed at first, but as the temperature of the cylinder rises and evaporation is accelerated, the water vapor increases and impairs the stability of the flame, which may flicker and become extinguished, even when the oxygen supply is apparently sufficient. The carbon monoxide, by diluting the products of combustion, tends to prevent condensation of steam and renders the flame more steady and more easily controlled. If very large volumes of gas are to be burned carbon monoxide cannot be used, as it renders the process too slow, and in such case measurement of the gas must be effected by meter. No carbon monoxide is then required. Natural gas may be burned in this apparatus at the rate of a liter in 12 minutes.

Experiments have shown that the position of the gas sample vessel, whether vertically or horizontally placed, makes little difference, as the carbon monoxide rapidly mixes with the gas in the sample vessel and the two emerge together at the burner.

There appeared to be some danger that carbon monoxide made from oxalic acid by heating with sulphuric acid might contain volatile sulphur compounds. Carbon monoxide, prepared from chemically pure sulphuric acid and recrystallized oxalic acid, was found after passage through sodium hydroxide solution, to yield no sulphuric acid when 10 liters were burned in the apparatus described.

Nitrous oxide may be substituted for oxygen in the process, and being readily obtainable in liquefied form, proves more convenient. During combustion in nitrous oxide higher oxides of nitrogen are formed in quantity sufficient to give a bright orange color to the gaseous contents of the combustion cylinder. The conditions are then very favorable to the complete oxidation of gaseous sulphur compounds.

The Point Abino gas well was visited again on September 3, 1897, when the tests made a year ago were repeated and other samples taken. Determinations of sulphur were made by the method of combustion above described. Determinations of hydrogen sulphide were also made by treatment of a known volume of gas at the well with alkaline lead acetate solution. The precipitated lead sulphide having been returned to the laboratory, its sulphur was converted by oxidation by means of potassium chlorate and hydrochloric acid into sulphuric acid, and precipitated and weighed as barium sulphate.

	By Combustion in Oxygen and Weighing as Barium Sulphate. Percentage by Volume.	By Precipitation as Lead Sulphide and Conversion into Barium Sulphate. Percentage by Volume.
Hydrogen sulphide.....	0.80	0.77
	0.83	0.86
	0.82	0.80
	0.82	....
	0.83	....

The only important difference as regards composition between the natural gas from the Niagara limestone and that from the Devonian measures of Western Pennsylvania consists, apparently, in the hydrogen sulphide which the former gas contains. If the sulphur compound be removed the residual gas is hardly distinguishable in composition from the natural gas of other regions. There appears to be reason for regarding the sulphur gas of Point Albino as natural gas which has received an addition of hydrogen sulphide derived from some local source. The same process which has produced natural gas in other regions has probably yielded this gas, but the hydrogen sulphide which it contains may be derived from a different source, and may have been of more recent origin.

The occurrence of hydrogen sulphide in the Niagara limestone is no doubt connected with that of gypsum, which abounds so largely throughout the region. Gypsum has been quarried near Buffalo and is often found scattered through the limestone in cavities. In artesian borings many alternations of limestone and gypsum are often encountered. Considerable masses of this mineral are found near Sherkston, north of Point Abino, and near Niagara Falls it occurs abundantly in the limestone.

If a genetic relationship exists, as is suggested by their association, it is difficult to determine whether the hydrogen sulphide, by oxidation

in presence of limestone, has produced gypsum, or whether the gypsum has by decomposition yielded hydrogen sulphide. If hydrogen sulphide has undergone oxidation there seems to be reason to suppose that the process must have occasionally remained incomplete when occurring at great depths, and have resulted in the setting free of sulphur. Sulphur does not appear to occur native in the region. If the hydrogen sulphide has penetrated from greater depths to undergo oxidation in the higher strata it should be found more abundantly in the lower gas bearing rocks, instead of being confined to the uppermost of these, the Niagara limestone.

On the other hand, the production of hydrogen sulphide from gypsum would seem to require an exposure to high temperature in presence of hydrocarbons—conditions which cannot have occurred. No one of the constituents of natural gas could, at temperatures existing in the stratified rocks of the region, have produced hydrogen sulphide by its action upon gypsum.

The Point Abino well produces, according to Mr. E. Coste, engineer for the Provincial Natural Gas Company, 1,000,000 cubic feet per day, and of this amount 7,000 cubic feet are hydrogen sulphide, corresponding to 600 pounds of sulphur, or 115 tons in one year. It is true that the well is not being drawn upon constantly up to its full capacity, but as it represents only one among the many outlets from which the sulphur gas escapes, it is evident that a very large quantity of sulphur, either in form of hydrogen sulphide, or burnt in furnaces to sulphur dioxide, is making its way annually into the atmosphere in the region of Buffalo and Niagara Falls.

Boiler Feeding by Injectors.

By Mr. James Whitcher, in *Electrical Review*.

If with thoroughly open and impartial minds we start to argue out the problem of boiler feeding, we find ourselves led almost irresistibly to the conclusion that injectors should afford absolutely the best and most economical of the several methods available, so much so, that we begin to wonder why it is not the universal method, for its use entails no waste of heat, and its mechanism is of the simplest possible character, and of cheap, compact and durable construction.

Yet, in practical circles, we find that, apart from the strikingly unanimous confidence that is reposed in it for locomotive purposes, the method is viewed with deepest and general mistrust. One scarcely ever hears a good word for injectors applied to stationary boilers. Engine drivers and stokers as a class would have none of them if they could help it, and where a pump and injector are fixed together to share the work the pump will be used, though in the last stage of ruin, while the injector is left to rust in idleness. When a reason is sought for this strong prejudice the answer is, that injectors cannot be relied upon, and that they use too much steam.

Now, it is evident at once that the former charge is an unjust one; for if injectors are not to be depended upon for general purposes, they would be equally unreliable for locomotives, and that is contrary to experience. Besides, plenty of instances can be adduced, particularly relating to low pressure boilers, where, in spite of the prejudice of attendants, single injectors (without a stand-by) have performed their duty in a thoroughly satisfactory manner for long periods, and required scarcely any attention or overhauling. It is, in fact, often the valves that give the greater part of the trouble that there is.

The second charge is of more importance, and it has undoubtedly a real foundation in fact, although the why and wherefore of it is a veritable puzzle, in view of the absolute absence of any avenue of escape for the energy that is apparently wasted in very liberal measure. Usually on the starting of an injector, the boiler pressure begins falling in a rapid, decisive manner, that means some anxious moments to the stoker, especially if he has the misfortune to be located in a district where smoke is under a strict taboo, and he has to be particularly canny with his dampers. The recovery is comparatively quick, but in the stoker's mind this does not go down to the credit of the injector. He ascribes it rather to the cessation of its baneful influence; and even when he does realize that this recovery is quicker than it would have been if the water had been pumped, there is not much comfort for him, for it is the fluctuation of pressure that concerns him most; and his grievance is that he cannot avoid it except by the short and frequent system of dosing his boiler, which he naturally abhors.

Probably the objectionable characteristic in the working of injectors is largely due to the use of a size too large for its average duty. The feed-water is supplied at too rapid a rate for the furnaces, and this rate of influx is not visible as it is in the case of pumping and is not so easily regulated. The intangible mode of operation of injectors is necessarily a considerable obstacle in the way of confidence in their use, and a simple and effective indicator fitted to them, showing the rate of flow into the boiler, would be of much service. An injector so fitted, and constructed so that the rate of feed could be regulated over a long range, would be the equal of a pump in convenience of working. But for lack of these features the stoker has certainly a true bill against the injector, and good reason for his preference for a pump. The latter gives him a sensitive means of controlling the pressure, additional to mere manipulation of the furnace, whereas the injector practically deprives him of it—not, of course, that it is impossible to regulate the feed with some forms of injectors, but the requisite judgment and familiarity in using the apparatus is not so easily acquired.

There is good reason for the belief that injectors are big steam eaters, for under many conditions they must be delivering the feed nearly at boiling temperature and sufficient steam is consumed to effect this. Thus supposing a supply of feed-water for half an hour's consumption is put into the boiler in the first five minutes. If pumped, the cool water lies low in the water space, and takes heat, mostly from the furnaces, and at a fairly constant rate throughout the whole period of 30 minutes. But if injected, the feed is not only delivered, but also heated nearly to steaming point, within the short period, and the extra duty is done, not direct by the furnace, but by the store of steam. Steam is made quicker during the subsequent 25 minutes, but the effect is a pronounced fluctuation of pressure, being a rapid fall followed by a slower rise; and the variations are too sharp to be modified easily by the mode of firing. The excessive draught on the store of steam produces almost as serious a fall of pressure as would result if the cool water from the pumps were to be sprayed into the steam space instead of delivered in a sluggish stream below the water level.

These fluctuations are not actually so very serious an objection to the injector, and they would be less significant if stokers would only educate themselves up to an intelligent use of the appliance. The chief trouble is that it forms so ready a handle for aspersions on the economy of injectors. Immature reasoning faculties find in the traveling back of the steam gauge, when the injector is turned on, triumphant proof of its wastefulness too conclusive to be confuted by any argument to the contrary; and it is useless generally, in the face of this conviction, to argue the impossibility of there being any real waste.

However, there are two counts on which indictments may be urged against injectors with a greater show of reason. These are that their use depreciates the efficiency and working capacity of the boiler, and the efficiency and capacity of the feed heating devices, if any. Now, as to to the first, we have it on good authority that live steam feed heaters, far from diminishing the efficiency and capacity of boilers, increase them by upwards of 10 per cent. This surprising fact was indubitably established some time ago by the experiments of Kirkaldy and others; but it is not at all clear yet whether it applies equally to all kinds of boilers and to all conditions of working. If it does, it is no more possible to maintain that injectors any more than feed heating devices of any kind, have a deleterious effect on the working activity of the boiler. Their influence, instead, should be quite the other way.

Were it not for the startling result of the above-mentioned investigations we should not have much hesitation in assuming that a cold feed would induce a more rapid transmission of heat than a hot feed, and therefore that the work proper obtained from the boiler is greater in the former case than in the latter. It tells us, however, that the reverse is the case; and the reason why is very obscure, no satisfactory explanation being possible with our present knowledge of the operation of heat transmission in a boiler. But the practical meaning of it all is that feed heating makes for economy, not only because of the net amount of heat added, but also because of the mere fact of its elevating the mean temperature of the boiler contents.

As to the second count we are on surer ground. For instance, it would certainly be a mistake to pass the feed-water from an injector indiscriminately through an exhaust feed heater, for little heat could be gained, and some might be lost. As most injectors are unreliable if supplied with water at a greater temperature than 100° F., we cannot gain much by drawing the supply through such a heater beforehand, and there is always the risk and inconvenience of its becoming overheated. Likewise with economizers, unless there is a substantial difference between the temperature of the feed delivered from the injector and the economizer temperature the feed-heating device becomes of negative value.

We can now perceive that in this bye-path lurks the one real and economical objection against the injector, for evidently the price of its

use may be the sacrifice of feed heating by the waste heat, and it is of serious magnitude. Suppose, for instance, that the working pressure is 140 pounds, that we feed the boiler by a pump of 50 per cent. efficiency through an exhaust heater, raising the temperature of the feed from 100° F. to 200° F. One pound of steam will pump 100 pounds of water, and the heat thrown away in the pump exhaust is 1,120 British thermal units, whereas the heat abstracted from the heater is 10,000 units. An injector would save the former quantity and reject the latter, which indicates a very large balance in favor of the combined pump and heater.

From the practical point of view, therefore, we see that it is bad policy to use an injector where feed heating is possible, and that it is also bad policy to use a pump, unless in conjunction with a feed heater. Thus there is a very clearly defined line of demarcation between their two respective "spheres of influence" and utility.

At first sight it does not appear as though the mere question of mechanical efficiency could have any decisive influence on the application of injectors to boiler feeding. It seems quite beside the point, seeing that thermal efficiency is the real desideratum, the which, in this case, is unity. Theoretically, boiler feeding does not imply any expenditure of work; it is simply the exchange of a volume of steam for an equal volume of water, and, since with suitable temperature conditions the steam may be condensed by and form part of the volume of water, there need be no loss of heat in the exchange. We assume, of course, that the levels of water in the boiler and feed tank are the same. There is no work lost, except in the friction of motion; and this appears again as utilizable heat, hence no heat disappears on conversion into work.

Where the mechanical efficiency of the injector becomes a significant factor is, that it may be so bad that there is necessarily a large difference between the feed water as supplied to it and as delivered from it. This temperature difference constitutes a very accurate and, indeed, absolute measure of the injector efficiency. It shows definitely how many unit volumes of steam have been absorbed to deliver each unit volume of water. If the difference is large, the function of feed heaters is, as we have seen, very seriously interfered with, and so a very momentous, though indirect, disadvantage is introduced.

An injector which could take water at, say 60° F., and deliver at 80° F., through a heat in the boiler, or take water from the heater at, say 200° F., and deliver direct to boiler, and do so over a full range of varying loads, could encroach very successfully on the province of the pump.

The second condition is apparently impossible unless the water supply is under pressure and the former is probably impracticable over a range of loads, and anything in excess of this would, under average conditions, make the combined efficiency of injector and heater decidedly less than the combined efficiency of pump and heater.

Hutton, in his valuable treatise on "Steam Boilers," states that the average performance of injectors is to deliver from 10 pounds to 18 pounds water per pound of steam. Now, at 140 pounds working pressure, about 200 pounds water should, in theory, be exchanged for 1 pound of steam. Hence the mechanical efficiency of injectors ranges below 10 per cent. With the highest theoretical efficiency of exchange, *i. e.*, 100 per cent., the temperature rise of the water injected would be somewhere about 5° F. But Hutton gives a table for the average rise of temperature in practice, which states that with a working pressure of 40 pounds per square inch, the rise is from 100° F. to 145° F.; at a pressure of 100 pounds it is from 120° F. to 175° F., and at 200 pounds pounds pressure it is from 145° F. to 255° F. It may be possible to obtain better performances than these; but as they stand it is evident that exhaust feed heating in conjunction with such injectors would be scarcely wise.

Apart from the question of feed heating, the injector merits preference above all other appliances for boiler feeding. It is so neat, compact and easily applied, and, at the same time, cheap and effective, that it ought to be in better and more general favor than it is. It would reap better opinions if attention were given to the following points in installing it: Firstly, as a precautionary measure, two injectors of equal size should be used in each instance, and their combined capacity should be about equal to the maximum rate of feed required and ought not to greatly exceed same. Secondly, the two injectors should be mounted quite independently of each other, and so that either can be easily dismantled and overhauled during working hours.

Indeed, these are advisable modes of procedure in the case of any boiler feeding or like appliances. Apparatus that can only be overhauled after hours is bound to receive the scantiest possible attention, and of a sort that is too hurried to be intelligent. Thorough duplication, if not carried to excess, is the truest economy in the long run, saving much in the way of emergency repairs and renewals and securing the best working conditions, and where feasible, it is only just to the attendants to provide it. For steam raising plant is especially exacting in the overtime duty it demands of them, and some thought ought to be given to the lightening of those duties in designing of same.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, September 10, 1898.

The Acetylene Exhibition—An Explosion in a Water Gas Apparatus—The Welsbach Light is a Success.

In May last I referred to the arrangements for a public demonstration of the capabilities of acetylene, which had received the countenance of the Society of Arts, and was to be held at the Imperial Institute. A short stay in London, a few days ago, afforded an opportunity for a personal inspection of the show. A long gallery or annex, in use as a museum, and well filled with a varied assortment of objects for inspection, was lighted by a number of pendants carrying about seven burners each. Outside the gallery, on a spare plot of ground, a run of temporary galvanized iron roofing was arranged, which afforded protection for a row of about 20 generators, each a sample of a particular make. On the outlet of each generator was a meter, from which a pipe was carried to one of the pendants inside. Each generating set and each pendant being labelled, the inquisitive visitor, having spotted any particular make of generator, could go into the gallery and see the gas produced. An adjoining gallery was cleared of its contents and fitted with stalls of the usual character, where the apparatus was exhibited out of action, in all the glories of brilliant enamel paint, together with various forms of lamps, fittings, burners, photographs, drawings, etc. It was amusing to see such obvious stop gaps as photographs of houses, a small country railway station, etc., where acetylene is the guiding star at night. And I am sorry not to be able to reproduce the portraits of the railway men who perform their nocturnal studies under the benign but searching rays of the new illuminant, for the information of your readers.

We have heard a great deal about the simplicity of acetylene apparatus. But standing in front of the mysterious looking generators, some of which are a perfect maze of pipes, cocks, sludge doors and water taps, one is reminded of the intellectual town councillor somewhere in the North, who said that any man who could shovel coals into a retort could manage a gas works. Most of the arrangements comprise an ordinary gasholder as a central feature, round which is clustered two or more generators, each with charging door, water supply and sludge cock, one or two U-tubes to act as condensers for the deposition of water that may be carried over with the gas, and a small washer or purifier. The apparatus is very much more complicated than the old "air gas" or air carbureting devices, as will be evident when we remember that two generating materials are required, one of which is a solid that must be stored out of contact with the air, and that a solid residue equal in bulk to the original material is left for removal.

The usual supply of literature is available, and a cursory glance over the same reveals the fact that the acetylene generator is behind the air gas, so far as competition with coal gas is concerned. The claim that acetylene is 15 times better than coal gas is freely advanced. "While coal gas is at best a doubtful 16 candles, acetylene is 240 candles," says one. And generally there is the same disposition to ignore modern improvements and trot out the rusty old iron tip on behalf of coal gas, while the new agent receives the utmost value that theory can assign to it, that is such a common feature in electric light circulars. After all, this is only an "ostrich-in-the sand" sort of dodge that is bound to recoil on itself. The present cost of calcium carbide is put at from 25s. to 30s. per cwt., or 6d. per pound for small quantities, which represents from 50s. to 100s. per 1,000 cubic feet of gas made for material alone. One firm claim as an improvement the mixing of a small percentage of carbonic acid with the acetylene as a means of reducing its tendency to smoke. The necessity for occasionally scrubbing the burners with an old tooth brush, for the removal of carbonaceous deposits, is generally insisted on.

The most interesting and novel line in the exhibition is the small portable lamps for optical lanterns and other scientific purposes, for bicycles or carriage lamps, and also available for domestic use. In many respects these are preferable to petroleum or oil lamps. It is a simpler and cleaner business to insert a cartridge of carbide, or to empty out the lime sludge, than to charge a lamp and renew the wick, and

there is no greasiness or inflammable vapor. Some of these are quite equal to petroleum lamps in point of elegance of design, and they are fitted for the library, the dining room or the drawing room. In this direction there is a trade to be done with carbide, as one or two such lamps are a useful adjunct in any house, and may well form a substitute for the guttering candle or the dangerous oil lamp. An elegantly designed pedestal, weighing perhaps 1½ lb. when charged, and representing 500 to 600-candle hours as regards lighting, seems to compare well with other portable lamps. These points, however, could be demonstrated in any ironmonger's shop, and it is impossible to avoid the conclusion that acetylene is scarcely of sufficient practical importance to call for anything in the way of a public exhibition, or to add to the dignity of the Imperial Institute. I was told that there was a fair attendance at first, but evidently all interest in the affair is now played out. At the time of my visit the place was apparently deserted. No one else was to be seen, but closer inspection revealed the presence of three or four caretakers in charge of stalls who appeared to be enjoying an afternoon siesta. One gentleman asked if I had any idea of purchasing an acetylene set, and on being answered in the negative, plainly indicated by his manner that further conversation would be a waste of time and energy. This suited me well, as I would sooner look and see things for myself than listen to the parrot-like tale that is the usual thing at exhibition stalls. And altogether the information gained by a walk round was both interesting and suggestive.

A remarkable accident has occurred at Plymouth in connection with a set of water gas apparatus. There was an obstruction in the apparatus, and as a preliminary step towards locating it the washer was unsealed. The valve between the scrubber and the gasholder was closed, and it was also assumed that the communication between the washer and scrubber was closed, though subsequent events show that, on account of a misunderstanding between the parties in charge, this was overlooked. The manhole cover on the scrubber was then removed, and the draught from the generator caused the residual gas in the scrubber, together with a portion of air, to be drawn back through the superheater. A slight explosion followed, the flame of which found vent at the scrubber manhole. Five men were injured by burns, two very slightly, and it was thought at first that the other cases would not prove serious, but in one instance fatal consequences have ensued. No injury was done to the plant, which was again put into action within a few hours. The apparatus had been in use for several months, and the cause of the accident is perfectly clear. The jury returned a verdict at the inquest to the effect that no one was to blame. The causes are of the same class as those which contribute to nine out of every ten accidents on a gas works. A stoppage occurs in some part of the apparatus, or the same is opened for inspection or repair.

Before the residual gas, which hangs obstinately in any odd corners or pockets, can diffuse and escape, a connection with flame is established by some unforseen chance. An explosion or firing back follows, perhaps not particularly violent, but attended with a flame of sufficient intensity to make things very uncomfortable for anyone who happens to be in the way. The existence of furnaces, lamps and other sources of flame in many parts of the works renders particular precautions desirable when a manhole cover must be removed. In justice to water gas, it is only fair to remark that this unfortunate occurrence was due to general causes, and in no sense a special risk attaching to the particular kind of apparatus employed.

I have recently had occasion to prepare a public lighting estimate, to include the use of the new Welsbach burners, and in the course of the necessary calculations have been greatly impressed with the possibilities opened out by the introduction of these appliances, either for cheap street lighting, where economy is a consideration, or for improved service where the lighting rate is not to be reduced. The acceptance of the said estimate in preference to a competing scheme put in by an Electric Supply Company, has led to several communications with the Welsbach Company and the makers of accessories, such as lanterns, anti-vibrators, chimneys, etc., and elucidated the fact that incandescent gas business is in a very active state. A remarkable extension in the use of Welsbachs for public lighting, probably eclipsing that of any previous year, will be a feature of the lighting season upon which we are now entering. In every department there are marked improvements. Lanterns are being rendered more capable of resisting wind and storms, and all sorts of devices are being introduced in order to protect the mantle—still, alas, as fragile as ever—from the influences of shock or vibration. In previous years many engineers shook their heads dubiously over an incandescent gas lighting scheme. They need do so no longer, as an inspection of this season's novelties is sufficient to convince the most skeptical that successful incandescent lighting is within the reach of all.

Toledo's Present Municipal Gas Situation.

By Traveler.

In the last issue of the Journal brief mention was made of the fact that the city of Toledo, through its Gas Trustees, had contracted for a supply of manufactured "fuel gas" to replace a failing natural gas supply. The whole history of Toledo's gas exploitation on municipal account constitutes a record of an unsatisfactory and unprofitable operation, and this last happening but again calls attention to the general foolishness that has characterized the matter and the management throughout.

To properly understand the situation a brief review of it is necessary. In the beginning the natural gas supply of Toledo was piped from the Findlay fields, some 30 miles or so, and furnished by "the Northwestern Company," a wheel within a wheel of—or, otherwise, the Standard Oil Company. This latter fact grated upon the sensitive citizens of Toledo, until, to get away from the monopoly in fact, but which in fact was rendering a thoroughly good service, the Toledo Company competing, was formed. In the course of time the inevitable followed. The Northwestern had the desire and the price wherewith to acquire the Toledo Company, and did it. This left the citizens again "in the grasp" of the Northwestern Company only, and to permanently free themselves from such direful fate, as well as to make a neat turn in some otherwise slow selling and third rate gas well lands, some enterprising parties inaugurated and cultivated a "movement" to the end that the city of Toledo should buy such lands and put in its own distributing, making a third natural gas system.

This movement was successful. The citizens—some of them, and enough—voted to put it through, and this was done, to the tune of $1,000,000 or more, in bonds, issued on the city's credit—this was about 1889 or 1890. Mark, now, the result. From that day to this the scheme has rarely if ever paid its full running expenses, to say nothing of earning the interest on the bonds. The interest on the latter, $50,000 good dollars per year or more, has had to be taken from the general funds of the city. All of the taxpayers being the source of these funds, they have the pleasure of so contributing to maintain an unsatisfactory natural gas department to supply a few. The matter is steadily becoming worse. The gas supply is decreasing and the outlook is precarious. The system isn't earning its bond interest, and rarely its expenses, and it became a question as to what to do about it. Comparatively lately a sub committee of Common Councils was directed to investigate and report. They did so, and reported that the system was now pretty much junk, was not paying, and that the city had better sell it. Such a report was extraordinary, in view of the fact that it is not usually customary or good policy to deprecate that which one may sell.

In the meantime the question became one of considerable prominence in the city, and his "Honor, the Mayor," came into it in the shape of a communication to Councils, recommending that the city keep its mains, abandon its fields, and, for $25,000 (for a city of over 100,000 population) put in a "carbonated" water gas plant. A new brand, truly.

It seems, however, that the real preposterous history in the matter was being made—while the City Hall crowd was wrangling—by the Board of Natural Gas Trustees, in which august body of three is vested the direct control of the municipal natural gas department. These gentlemen chafed under the investigation and report of the Council Committee, and in order to set themselves aright before their constituents, also sent a communication to the Council, taking issue on seemingly trifling points.

In the last paragraph of that communication is the history in question. After and within the one paragraph in which they recommend that the city build its own gas plant, they add, we "*have contracted*" for a supply of manufactured fuel gas. There are several amazing features to this part of the matter. First, that they could contract in secrecy and without reference to other authorities—a most arbitrary power, indeed. Second, that they should, without any publicity of moment, if at all. Third, that they should within three days from the receipt of the contractor's proposition, at a "special meeting," without any known trip of investigation, in the entire absence of any similar existing successfully operated plant on any such scale as contemplated, and in the face and the record of the well known complete failure of schemes and systems in general, for the replacing of natural gas. However, they did it, and the taxpayer will probably have more to pay in the continuation of Toledo's natural gas department and its transition to a manufactured fuel gas basis.

The so-called "process" that has been contracted for is the Bidelman, that for 10 years or more has cropped up here and there in the

West, and in all that time has attained no standing worth speaking of. It consists of the old and simple scheme of pumping air through oil, or otherwise so charging it with oil vapors that the mixture will burn. It is air plus oil vapor—"greased air," pure and simple. It is made mechanically without heat, and is entirely apart from any chemically made gas. A collection of pumps, compressors, cylinders and tanks comprises the plant. The amount of gas made is in direct proportion to the speed of the pump or blower. It is a large edition of a "Springfield gas machine," such as is used in country houses, and furnishes a product essentially similar. This product, as it may be needed to eke out the failing natural gas supply, the Honorable Trustees have contracted to take for a term of five years, and to pay therefor the price of from 18 to 16 cents per 1,000 cubic feet (of greased air), on a scale of quantities ranging from 500,000 to 2,000,000 cubic feet daily. At the end of five years the city may buy the plant for 10 per cent. on its earning power on the above rates, based on the volume sold. The gas will be resold at probably 25 cents per 1,000 to the citizens, and they will expect it to quite equal natural gas. Truly, the lot of the expectant citizen is not to be envied; first, probably getting a good natural gas; then a poor supply; then a mixture; and again only greased air. If this Bidelman product does not directly drive the customers to the Northwestern Company's mains the writer misses his guess.

Such is the situation in Toledo to-day. A natural gas plant and pipe system that isn't worth the investment; a million dollars outstanding bonds on a non-paying and losing game; a steadily decreasing gas supply and a cheap greased air substitute contracted for. Verily, the citizens should have let well enough alone and have been well content with the original Northwestern Company's supply!

The Illegitimate Watt.

[By Mr. J. L. Morgan, in *Electrical Engineer*.]

The recent disappearance of the Rev. P. F. Jernegan, the erstwhile promoter and expert of the Electrolytic Marine Salts Company and despoiler of our argentinic and auriferous seas and oceans, brings to mind the researches of other notorious sensationalists. That love of the marvelous shared by the nations of the earth in common, and by Americans in preferred stock, has been the capital of many a wily promoter.

While Jernegan only transferred electrolytically $338,378.40 from the pockets of the stockholders to his own, the more lucrative efforts of Keeley and his motor, and of Pennock, of battery fame, are still fresh in our minds. Although the antediluvian electric belt scientist still continues to charge his harness up to the proper voltage with red pepper, and the electric bottleman is content to use essential oil of mustard, without fuse blocks or lightning arresters, as his "subtile fluid," and the electric hair brush man, with permanent magnets concealed in the handle of the brush, is happy in the delusion that the little compass included in his outfit demonstrates his therapeutic claims, there has sprung up a newer and smarter element of fakirs, whose applications of the current are more dangerous, and who are bringing the earnest, honest and hustling little watt into disrepute.

Nowadays the dishonest jockey simply lets his mount loaf along till he is into the stretch, when he connects his noble steed with a few hundred miles of secondary from a step-up coil and the effect is instantaneous. The enterprising burglar now discards the "jimmy" and drill and carries a few feet of wire and a large carbon which he shoves into the safe in the direction the money is most liable to be.

The "look-out" of the roulette game now has his switchboard to mind. Concealed under the arm of his chair are buttons corresponding to the red, black, odd, even, high, low, and also rows of numbers. These buttons connect by commutators to electro-magnets on the wheel, the ivory ball having a soft iron core of high permeability, and the way the "look-out" can "copper" all bets is beautiful. In all the history of electrical engineering, there has been probably no piece of metal placed where its intrinsic value is appreciated like the busy little core of the roulette ball.

The electric bitters, tonics and waters exist without number, but it remained for Kelsey, Kan., to have a truly electric spring. This spring was owned by the local "locksmith and electrician," and for a time did a thriving business. Knives were magnetized until the nails in the floor of the corner grocery were almost pulled out when there was a full attendance of the chronic whittlers. But the unfeeling, unprincipled, unhung owner, was discovered filling his batteries in an adjacent shed and the subsequent finding of a solenoid around the spring exploded the magnetic theory, and was the immediate cause of a large number of invalids again losing their health.

The writer had a ludicrous experience with one of these fakirs some months ago. As City Electrician I received a telephone call from a doctor in one of the large office buildings to come and inspect an "electric lounge." I had never heard of an electric lounge, but putting on a bold front and a look of infinite wisdom, I knocked at the office door. I was admitted by the doctor, and he "looked the part." Tall, melancholic, and dressed in somber black, he looked the typical wizard, and although his long Prince Albert coat, negligé shirt and lay-down collar were a bit odd, his horn spectacles and curly wig gave him a look that was not soon to be forgotten. After showing me the mechanism of the lounge, which consisted of 32 electro-magnets underneath the surface, he explained that with the double-throw switch he could get a steady stream of magnetic lines through your system much like you would squirt water on a chained dog, or with the other throw of the switch you get the short arm jab effect derived from the alternating current. All that he wanted was a certificate stating that it was a good and safe institution to patronize, which no doubt it was, as he told me that he had reclined all morning on the lounge and that the effect was marvelous. Upon closer examination I saw that one of the wires was disconnected. The wily contractor had simply wound the magnets with any old scrap wire he happened to have and then left the circuit open, knowing that the machine was as potent without the current as with it. An employee of the firm that made the machine was present, and at my suggestion he reluctantly closed the circuit and threw the switch on the "short arm jab" side of the switch for a trial trip. And the effect was marvelous. The 32 magnets vaporized like shots from a rapid-fire six-pounder, the excelsior stuffing took fire, and to all this the doctor danced wildly and howled, "Turn her off! Turn her off!" The device was getting its current from a keyed socket on the chandelier, and although it was working grandly, I turned the key, but the current was too heavy to be broken by such a small "break," so we had pyrotechnics at two places.

When the current was finally turned off and the room cleared of the dense white smoke from the excelsior and the sickening fumes from the burnt shellac and varnish, an inventory showed one electric lounge in a wreck, a chandelier in the same condition, a tremendous heap of law books in the area way, where they had been thrown by an excited tenant, two music teachers and a voice culturist in a swoon, and a very mad and disgusted doctor.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Robert Ewing, for a long time connected with the office force of the Birmingham (Ala.) Gas Company, has accepted a position on the staff of the Birmingham *News*.

Mr. W. H. Winslow, writing to the Journal, from West Superior, Wis., under date of the 13th inst., says:

To the Editors American Gas Light Journal: I am sure that many of your readers found, in Mr. Britton's chart, illustrated in the Journal of September 5th, something which "filled a long-felt want." To such I would suggest that, for purposes of comparison, the chart may be made of much greater value by a few slight additions. Let the vertical rulings be continued downward about an inch, and four horizontal lines drawn as follows:

Weather..... { 1898 ..... 1897 .....

Day of week..... { 1898 ..... 1897 .....

By inserting in the weather column the words "clear" or "cloudy," and filling in the initials of the days of the week, the chief factors of variations in output will be clearly set forth. When the conditions during the day vary the state of the sky towards sunset should of course be inserted. Where a considerable part of the output is used for heating purposes two additional spaces for temperature might be of value. To get a still better comparison of the output for two years the figures for nearest corresponding day of the week may be used to start with; *e. g.*, under September 1, 1898, would be inserted the gas sent out September 2, 1897, both these dates falling on Thursday. This plan makes a very symmetrical chart, as the great differences between the Saturday and Sunday evening outputs coincide for both years.

The State Inspector of Gas Meters has appointed Mr. Oscar F. Price, of Jamestown, a deputy inspector. Mr. Price is to have supervision of the meters used by the natural gas companies of Western New York.

At the annual meeting of the Worcester (Mass.) Gas Light Company

the following officers were elected: Directors, Messrs. Chas. D. Lamson, J. H. Clarke, Albert Wood, A. G. Bullock, Francis H. Dewey, Samuel B. Woodward and James P. Hamilton; President and General Manager, Mr. Charles D. Lamson; Treasurer and Clerk, Mr. James P. Hamilton. The report of the doings of the Company for the past year, as compiled by Manager Lamson, shows that the output for the twelve-month was 218,923,400 cubic feet, that the meters in use number 7,712, that the main system covers 81.1 miles, and that 3,800 gas stoves are in use. The Company is in excellent financial and physical condition.

THE sub-committee of the Committee on Light, Richmond (Va.) Board of Alderman, appointed to consider the petition of Messrs. Armitage & Co. for the extension of their contract for the purchase of tar from the city gas works from one to two years, having considered the matter, submitted the following recommendation: That the contract with the Armitage Company be made to cover a period of two years, the purchasers to pay for the tar at the rate of $1 per barrel for the first year, the rate for the second year to be $1.25 per barrel.

THE Faribault (Minn.) Gas and Electric Company has advertised for bids for the laying of about 2 miles of gas mains, the work to be completed before December 1st.

PAPERS announcing the incorporation of the New City Gas Company have been filed with the Secretary of State of West Virginia. The capital stock is fixed at $200,000, and the incorporators are Messrs. R. D. McCue and A. D. Apperson, of Staunton, Va.; H. G. Marquand, of New York; Lewis C. Harris, of Forest Hill, N. J.; and F. B. Poor, of Hackensack, N. J. The home office of the Company is Staunton, Va.

THE Louisville (Ky.) Gas Company has named Mr. Richard Montfort, Chief Engineer of the Louisville and Nashville Railroad, to represent it on the Board of Adjusters that are to fix the rate that the Company may charge for gas for the next three years. The city has not yet named its representative.

AT the annual meeting of the shareholders in the Woonsocket (R. I.) Gas Company Charles H. Darling was named to succeed his father (the late Gilbert Darling) on the Board of Directors. Other changes were: George A. Mongeon succeeds Henry C. Kimball, Warren A. Cook succeeds the late Joseph E. Cole, and George A. Buffum replaces John W. Ellis.

THE meeting of many of the manufacturers of gas stoves, held about a fortnight ago at Little Mountain, near Cleveland, O., does not seem to have resulted in anything substantial, so far as the main objects of the gathering were concerned. The leading thought of those who called the meeting was to organize an association to "secure uniformity in prices and sizes."

WE understand that the plants of the Lincoln (Ills.) Gas and Electric Light Company have been sold to Joseph H. Vail, of Chicago, who is said to have represented certain Eastern capitalists in the transaction.

FOLLOWING our information respecting the above sale comes the news that the City of Lincoln Gas Company has been incorporated, with a capital stock of $100,000. The named incorporators are Frank R. Ferguson, George Skinner and Willis H. Hutson.

THE authorities of Westwood, N. J., are considering a petition for the right to construct and operate a gas works there.

MR. JAMES C. BAYLES, General Manager and Chief Engineer of the Bayles Engineering Company, New York, writes us that his Company is having good success with an interesting addition to its appliance for "gas distribution without leakage loss," in the shape of a complete line of pantaclinal insets and repair fittings for gas mains. These fittings are made double hub, hub and spigot, or double spigot. Each fitting contains a pantaclinal joint, the function of which is to introduce extensibility to accommodate expansion and contraction and flexibility to accommodate natural movement. The insets are intended to be used with wrought iron mains, or with hub and spigot mains, and it is claimed for them that they correct all the evils incident to rigidity in buried lines. The repair fitting, for mending breaks in mains, is intended not only to repair the fracture, but to guard against a recurrence of the accident from the causes which brought it about originally. The protection against leaks or fractures afforded by the insertion of a pantaclinal repair fitting, in accommodating longitudinal or other movement, extends for a greater or less distance, according to the character of the soil in which the line is laid. In a tenacious clay it would probably not protect more than two or three lengths; but in a light soil the area of protection afforded by pantaclinal inset is of much greater extent. The same principle is also applied to service connections, for 1-inch, 1¼-inch, 1½-inch and 2 inch street ells. All of these fittings are being received with much favor, and it is unquestioned that they give promise of great utility.

THE Arlington (Mass.) Gas Light Company's clever Superintendent, Mr. Wharton, is superintending the changes that are being made on the plant, which changes virtually amount to its reconstruction. The largest item in the plans is that which calls for a gasholder, up to retaining about 100,000 cubic feet. The contract for the holder was awarded to Messrs. Bartlett, Hayward & Co. Superintendent Wharton has also made considerable main extensions this summer.

AT a meeting of the Mystic (Conn.) Electric Light and Gas Company, held a fortnight ago, the following officers were elected: Directors, D. B. Spaulding, T. C. Perkins, Chas. E. Perkins, H. B. Noyes, Jr., and C. S. Allen; President, Thos. C. Perkins; Vice-President, D. B. Spaulding; Secretary, Clinton S. Allen; Treasurer, H. B. Noyes, Jr. The Board voted to make an issue of bonds.

THE following is a transcript of the "ordinance of interference" adopted by the authorities of Dallas, Texas, in their latest dealings with the Dallas (Texas) Gas and Fuel Company:

"*Whereas*, The Dallas City Gas Light Company, claiming to exercise a franchise to use the streets, alleys and public grounds of the city for its pipes, under an ordinance approved Aug. 21, 1873, did without the authority of the City Council attempt to transfer and assign such franchise so claimed to the Dallas Gas and Fuel Company, and ever since about the year 1892 has ceased to operate and conduct the business in this city for which it was incorporated; and

"*Whereas*, The Dallas Gas and Fuel Company has without authority of the City Council been exercising and claiming the right to exercise the franchises claimed by the said Dallas Gas and Fuel Company, and has extended its pipes and mains under many of the streets, alleys and public grounds of the city; and, whereas, whatever franchises either of said corporations ever possessed are revoked by the city, now, therefore,

"Sec. 1. Be it ordained by the City Council of the city of Dallas that any and all rights, privileges and franchises claimed by the Dallas Gas and Fuel Company, or Dallas City Gas Light Company, to use the streets, alleys and public grounds of this city for its pipes, mains, fixtures and appurtenances, and of distributing gas through said pipes, mains and fixtures, be and the same are hereby revoked; and it is hereby declared that any future use of any of the said streets, alleys and public grounds by either of said corporations for any of said purposes will be unauthorized and unlawful.

"Sec. 2. That nothing in this ordinance shall be construed as an admission by the city that either of said corporations has lawfully acquired any such rights and franchises as above mentioned, by virtue of any permit or permits heretofore issued by an officer of the city without special authority of the Council.

"Sec. 3. That the Dallas Gas and Fuel Company be and the same is hereby required to remove from the streets, alleys and public grounds of the city, without delay, all pipes, mains and other property now under or over any of the streets, alleys or public grounds of the city."

THE Charlotte Consolidated Construction Company, of Charlotte, N. C., has arranged for the building there of a complete gas plant, which plant unfortunately it is proposed to operate in opposition to the existing plant of the Charlotte Gas Light Company. The contracts for the apparatus have been awarded, and work under the agreements is now underway. The generating machinery is to be furnished and erected by the Western Gas Construction Company, of Fort Wayne, Ind.; the holders (one of 50,000 cubic feet and one of 20,000 cubic feet) are to be constructed by the Stacey Manufacturing Company; and the street mains and specials are to be furnished by the Glamorgan Foundry Company. The gas making plant will consist of a 5-foot, double superheater Lowe water gas apparatus, of the type manufactured by the Western Gas Construction Company. The purifiers (two in number) are to have the dimension of 10 feet by 12 feet by 5 feet inside measure. The equipment is also to include a Root exhauster, a 6-foot station meter and an 8-inch Connelly governor. The manufacturing plant and the street main system as well were planned by Captain W. Henry White.

The Market for Gas Securities.

The trading in city gas shares for the week was quite like that of the preceding week. Considerable business was transacted, on a generally lower scale of prices, and there was much evidence of uneasiness that a further sharp break in values all around was imminent. In fact, in every broker's office the advice seemed to flow freely that Consolidated was a sale. In face of all this, and despite the further fact that the odd war for business goes on, we unhesitatingly advise the purchase of Consolidated gas at the market.

Brooklyn Union is in good demand, despite the denial that the Company contemplated any increase in its dividend rate.

The quotations tell their own story, which story is generally to the effect that prices are lower through the general list.

The United Gas Improvement Company has declared a regular quarterly dividend of 2 per cent., payable the 15th prox.

Gas Stocks.

Quotations by Frederic B. Cochran & Co., Brokers and Dealers in Gas Stocks.

20 AND 22 BROAD STREET, NEW YORK CITY.

SEPT. 26.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$37,730,000	100	181½	182
Cental Union, Bonds, 5's	3,000,000	1,000	104½	105
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	8,500,000	100	320	330
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co.	13,000,000	100	27½	28½
Preferred	10,000,000	100	68	70
Bonds, 5's	11,000,000	1,000	100	100¼
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000		107½	108½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	135	140
Preferred	5,000,000	100	155	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	126	127½
" " Bonds (5's)	15 000,000	1,000	115	115½
Bay State	50,000,000	50	3	3¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	..
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	21	22
" " Bonds, 5's	5,250,000	1,000	95½	96½
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	89	91
1st Mortgage	1,207,000	1,000	101	103½
Consumers. Jersey City	2,000,000	100	78	85
" Bonds	600,000	1,000	101½	103½
Cincinnati G. & C. Co.	8,500,000	100	202	202½
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Consolidated, Baltimore	11,000,000	100	64½	65
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000		..	..
Consolidated Gas Co. of N.J.	1,000,000	100	16	21
" Con. Mtg. 5's	380,000	1,000	75	80
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,500,000	50	65	65½
" Prior Lien 5's	4,538,000	1,000	94¼	94½
Detroit Gas Co., 5's	428,000	1,000	..	..
" Inc. 5's	34,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wa	2,000,000	..	75	80
" " Bonds	2,000,000	..	88	
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jackson Gas Co	250,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	78	85
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	49¼	49½
Preferred	2,500,000	100	92½	..
Bonds	10,000,000	1,000	105	105¼
Madison Gas & Elec. Co.	400,000	100	..	..
" 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	123	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	52	53
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103⅞	104
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	85⅞	86
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage 6's	650,000	1,000	84	87
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co.	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	17	18
Bonds	1,500,000	1,000	94	97
Washington, D. C	2,000,000	20	250	.
Western, Milwaukee	4,000,000	100	85¼	86
Bonds, 5's	3,556,000	.	101¾	102½
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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., DREXEL BUILDING, PHILA., PA., Sept. 22, 1898.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable on Oct. 15, 1898, to stockholders of record at the close of business Sept. 30, 1898. Checks will be mailed.

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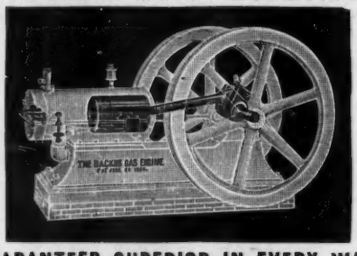

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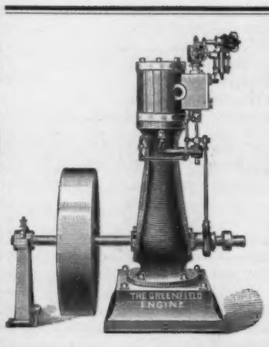

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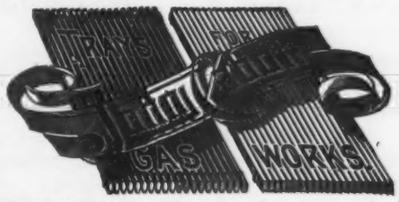

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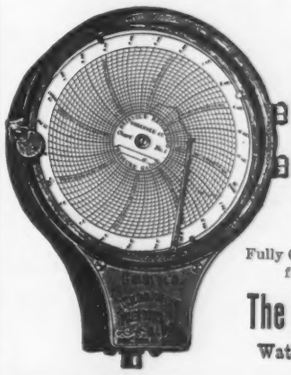

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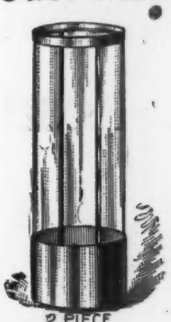

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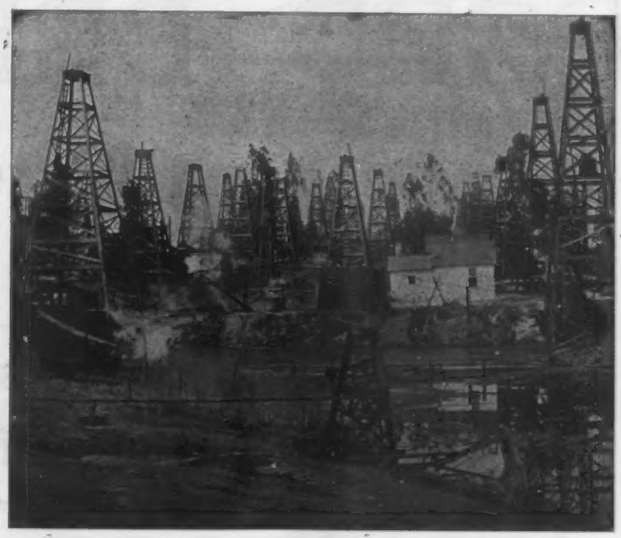

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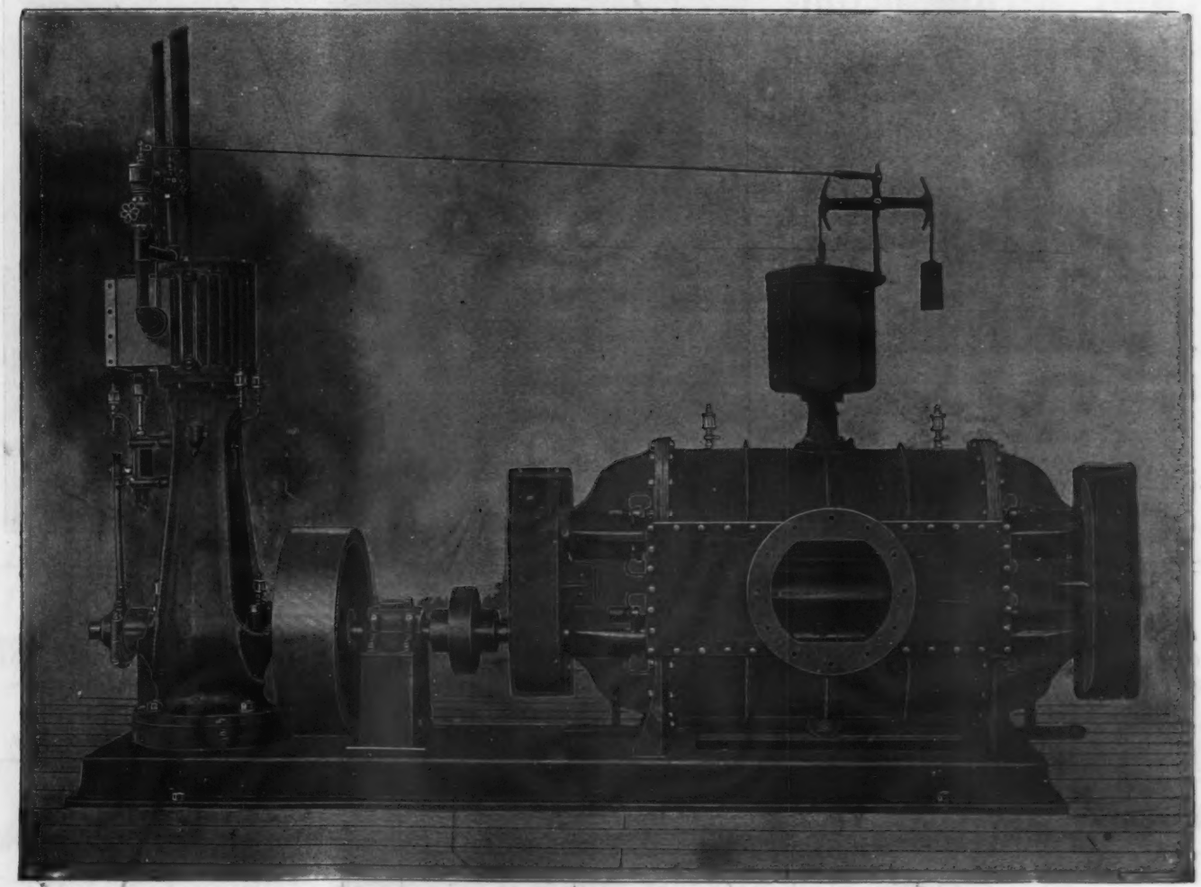

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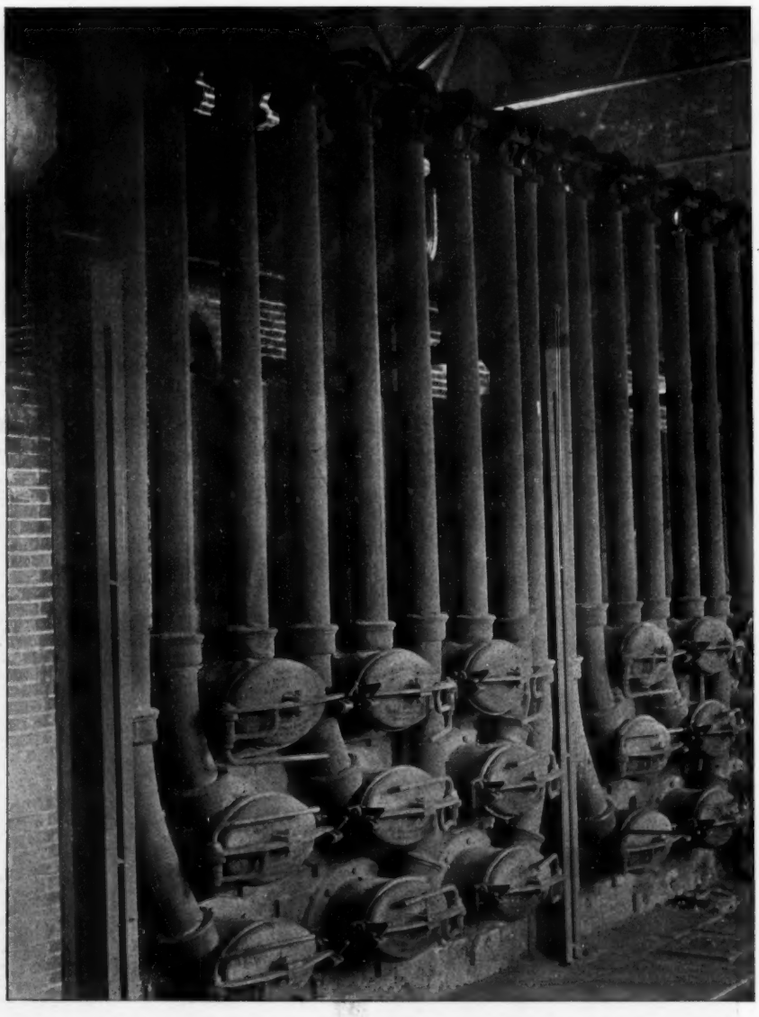

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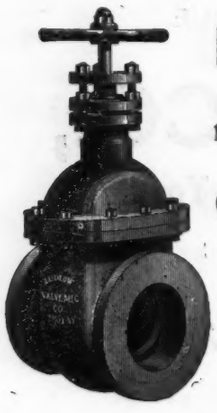

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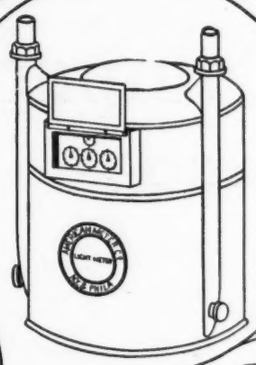

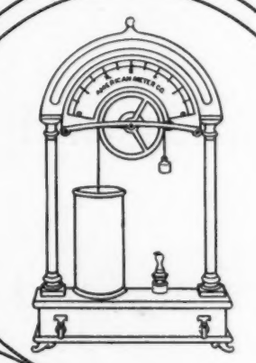

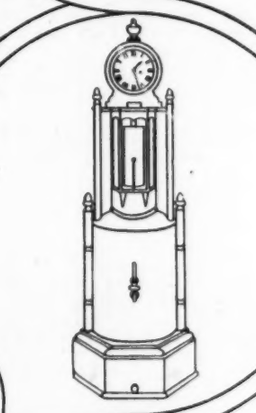

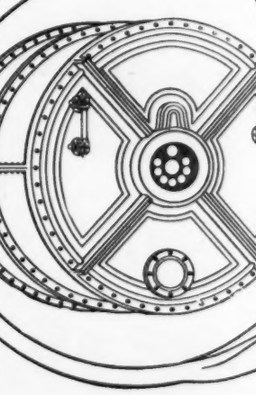

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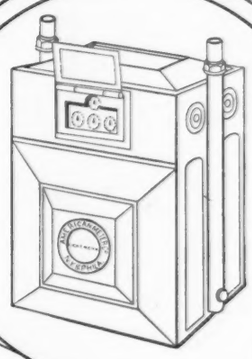

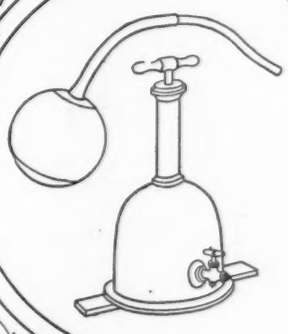

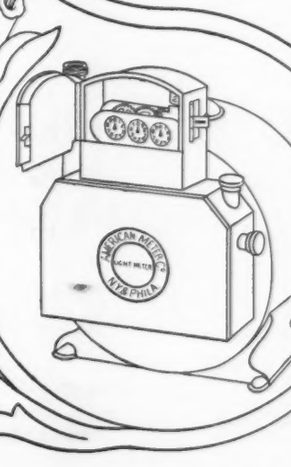

PUBLIC LIGHTING TABLE.

OCTOBER, 1898.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sat.	1	6.10 PM	7.10 PM	5.30	5.00
Sun.	2	6.10	7.50	5.30	5.00
Mon.	3	6.10	8.30	5.30	5.00
Tue.	4	6.10	9.10	5.30	5.00
Wed.	5	6.10	10.00	5.30	5.00
Thu.	6	6.10	11.00	5.30	5.00
Fri.	7	6.10 LQ	12.00	5.30	5.00
Sat.	8	6.10	1.00 AM	5.20	5.10
Sun.	9	6.00	2.00	5.20	5.10
Mon.	10	6.00	3.00	5.20	5.10
Tue.	11	6.00	4.00	5.20	5.10
Wed.	12	6.00	5.10	5.20	5.10
Thu.	13	6.00	5.10	5.20	5.10
Fri.	14	6.00	5.10	5.20	5.10
Sat.	15	6.00 NM	5.10	5.10	5.20
Sun.	16	5.50	5.10	5.10	5.20
Mon.	17	5.50	5.10	5.10	5.20
Tue.	18	5.50	5.10	5.10	5.20
Wed.	19	5.50	5.10	5.10	5.20
Thu.	20	8.20	5.10	5.10	5.20
Fri.	21	9.40 FQ	5.10	5.10	5.20
Sat.	22	10.50	5.10	5.00	5.30
Sun.	23	12.00	5.20	5.00	5.30
Mon.	24	1.10 AM	5.20	5.00	5.30
Tue.	25	2.20	5.20	5.00	5.30
Wed.	26	3.20	5.20	5.00	5.30
Thu.	27	4.30	5.20	5.00	5.30
Fri.	28	No L.	No L.	5.00	5.30
Sat.	29	No L FM	No L.	4.45	5.35
Sun.	30	No L.	No L.	4.45	5.35
Mon.	31	5.30 PM	7.10 PM	4.45	5.35

TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45

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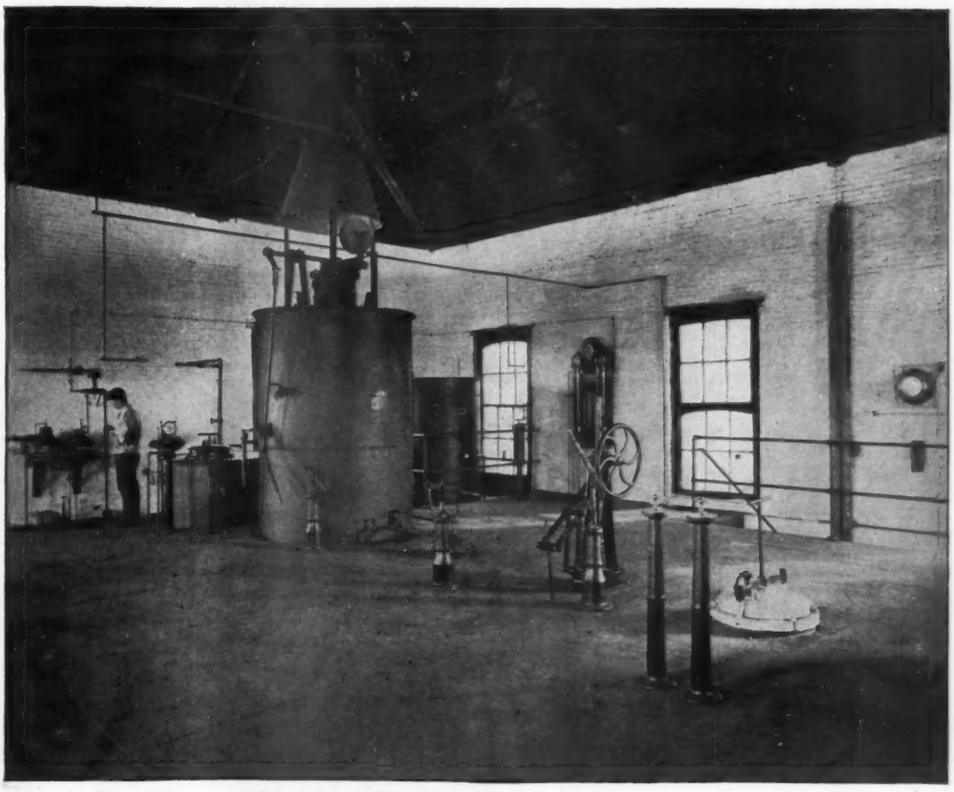

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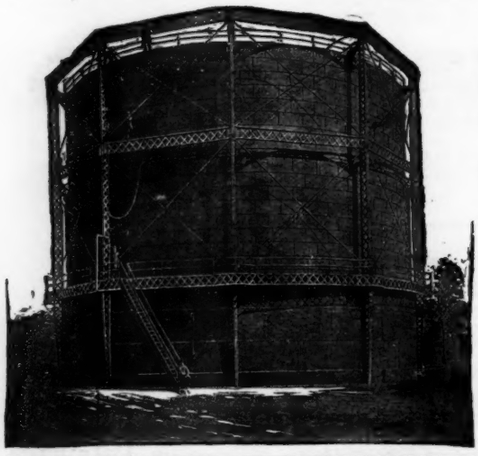

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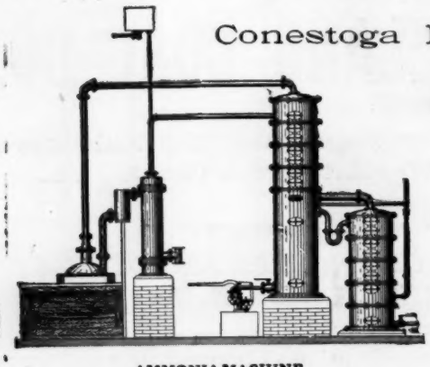

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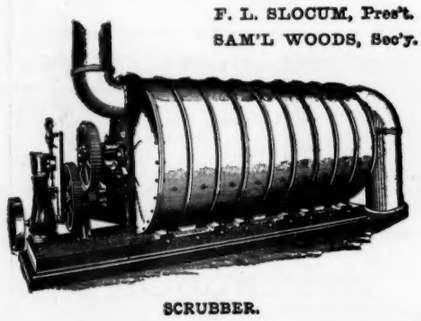

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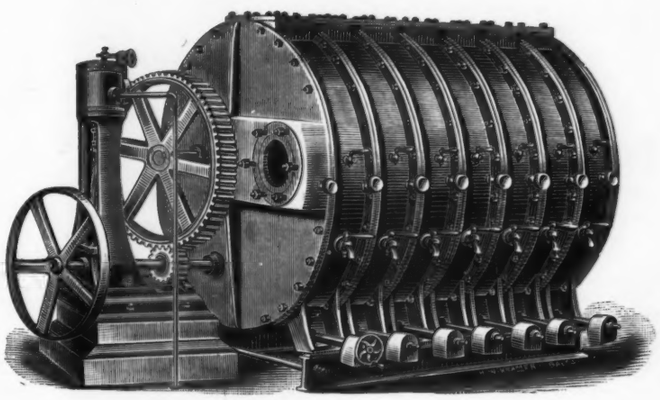

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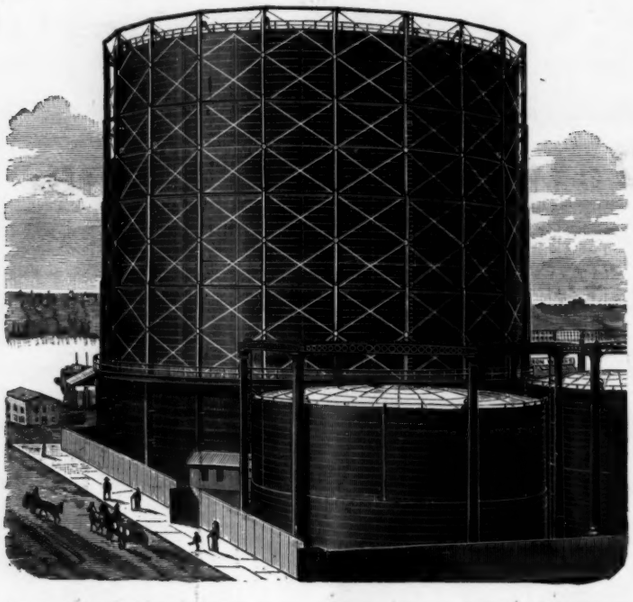

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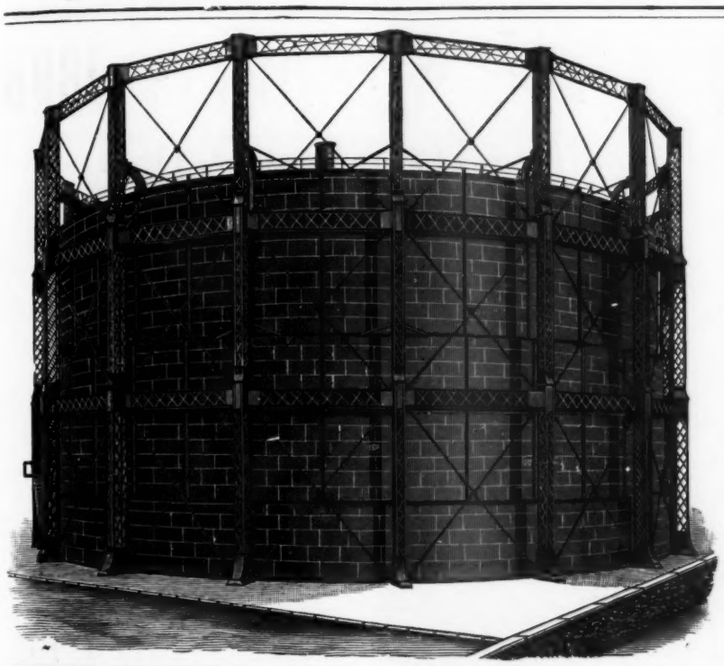

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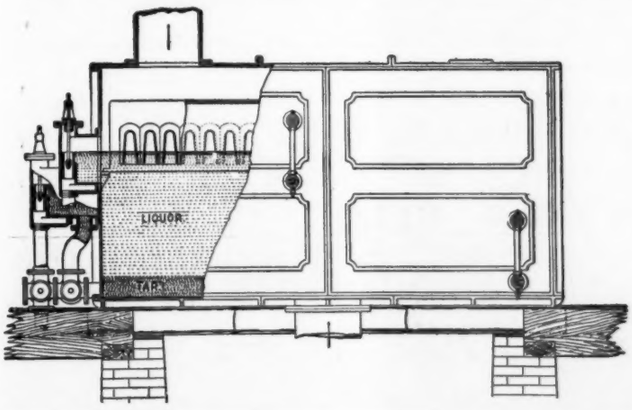

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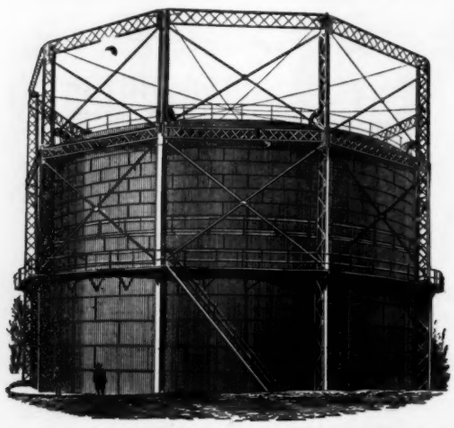

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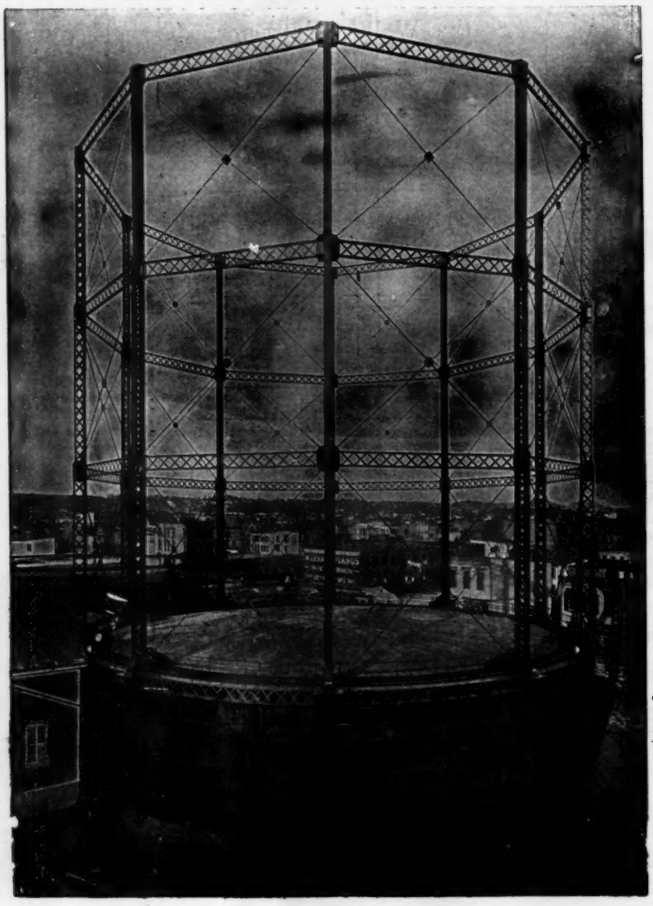

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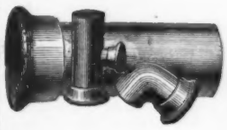

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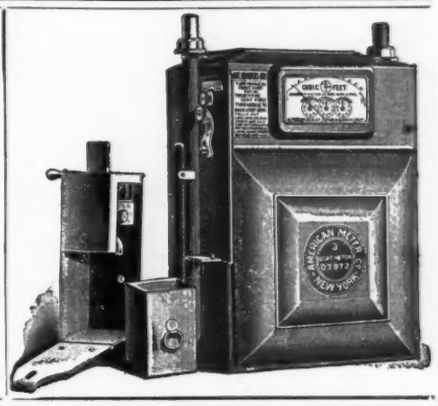

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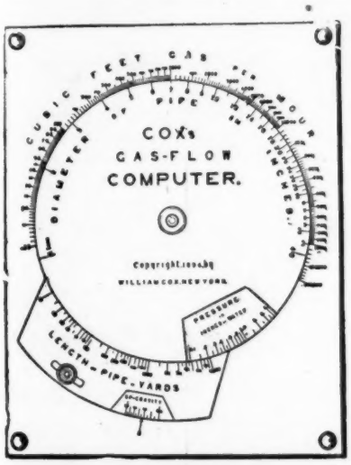

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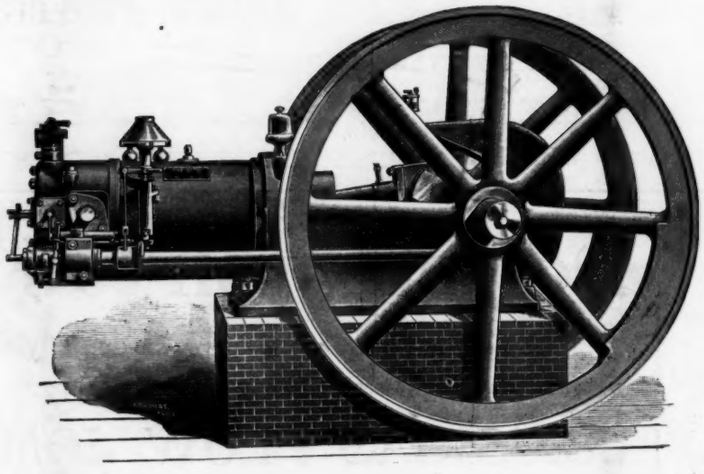

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